ENTERED

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

MAY 0 9 2018

OFFICE OF
AIR AND RADIATION

Mr. Kenneth E. Princen
Assistant Manager
Office of the National TRU Program
Carlsbad Field Office
U.S. Department of Energy
P.O. Box 3090
Carlsbad, New Mexico 88221-3090

Dear Mr. Princen:

This letter provides the results of the U.S. Environmental Protection Agency's (EPA) March 6-8, 2018, continued compliance inspection of the Central Characterization Project (CCP) waste characterization program for contact-handled (CH) and remote-handled (RH) transuranic (TRU) waste at the Oak Ridge National Laboratory (ORNL) near Oak Ridge, Tennessee.

During this inspection, the EPA staff sampled the following TRU waste characterization activities and processes:

- Acceptable knowledge (AK) for CH and RH wastes
- The NDA systems (IQ3 and the Mobile ISOCS Large Container Counter 2) used to characterize CH TRU waste
- The Dose to Curie (gamma and neutron) process for characterizing RH TRU waste
- Real-time radiography (RTR) for CH TRU waste
- Visual Examination (VE) for CH and RH TRU debris waste

Based on the results of this continued compliance inspection, the EPA confirms that the CH and RH TRU waste characterization programs implemented by the CCP at ORNL are technically adequate and continue to comply with 40 CFR 194.24 requirements. A more detailed discussion of the inspection is provided in the attached report.

If you have any questions, please contact Ed Feltcorn (202 343-9422).

Sincerely,

Tom Peake
Director
Center for Waste Management and Regulations

Enclosure

cc:
Alton Harris, DOE HQ
Edgard Espinosa, DOE HQ
Julia Shenk, DOE HQ
Todd Shrader, CBFO
Tom Carver, CBFO
Norma Castaneda, CBFO
Jon Richards, EPA Region 4
Site Documents, CBFO

EPA DOCKET NO: A-98-49; II-A4-217
EPA AIR E-DOCKET NO: EPA-HQ-OAR-2001-0012-0478

WASTE CHARACTERIZATION INSPECTION CONTINUED COMPLIANCE REPORT

EPA INSPECTION OF THE CENTRAL CHARACTERIZATION PROGRAM'S WASTE CHARACTERIZATION PROGRAM AT THE TRANSURANIC WASTE PROCESSING CENTER AT THE OAK RIDGE NATIONAL LABORATORY

March 6–8, 2018

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

May 2018

TABLE OF CONTENTS

LIST OF TABLES

ATTACHMENTS

ABBREVIATIONS, ACRONYMS AND INITIALIZATIONS

%R	percent recovery
%RSD	percent relative standard deviation
χ^2	chi-squared
AK	acceptable knowledge
AKA	AK assessment
AKE	Acceptable Knowledge Expert
AKPKE	Acceptable Knowledge-Process Knowledge Expert
AKSR	acceptable knowledge summary report
Am	americium
ASTM	American Society for Testing and Materials
Att.	Attachment
BDR	batch data report
BEGe	broad energy germanium detectors
BoK	basis of knowledge
CBFO	Carlsbad Field Office
cc	cubic centimeter
CCE	chemical compatibility evaluation
CCP	Central Characterization Program
CFR	Code of Federal Regulations
CH	contact-handled
CHSA	Contact Handled Storage Area
Ci	curie
CIS	characterization information summary
CRR	characterization reconciliation report
Cs	cesium
CSSF	correlation and summary surrogate form
DOE	U.S. Department of Energy
DQO	data quality objective
DR	discrepancy resolution
DTC	dose-to-curie
DVD	digital video disk

EA	Expert Analyst
EM	Environmental Management
EPA	U.S. Environmental Protection Agency
ESH&Q	Environmental, Safety, Health and Quality
FGA	flammable gas analysis
FRAM	Fixed energy Response function Analysis with Multiple efficiency
FY	fiscal year
g	gram
g/cc	gram per cubic centimeter
HLW	high-level waste
ISOCS	In Situ Object Counting System
ITR	Independent Technical Reviewer
IWMDL	Interface Waste Management Documents List
kg	kilogram
LEGe	low energy germanium detectors
LLD	lower limit of detection
LOQI	list of qualified individuals
MCS	Mobile Characterization Services
MDA	minimum detectable activity
MDC	minimum detectable concentration
MGA	multigroup analysis
MILCC2	Mobile ISOCS Large Container Counter 2
mR	milliroentgen
mR/hr	milliroentgen per hour
mrem	millirem
mrem/hr	millirem per hour
N/A	not applicable
nCi	nanocurie
nCi/g	nanocuries per gram
NCR	nonconformance report
NDA	nondestructive assay
NDE	nondestructive examination
NFS	Nuclear Fuel Services

Np	neptunium
NWP	Nuclear Waste Partnership, LLC
OJT	on-the-job training
OREM	Oak Ridge Office of Environmental Management
ORIA	Office of Radiation and Indoor Air
ORIGEN	Oak Ridge Isotope Generator
ORNL	Oak Ridge National Laboratory
PDP	Performance Demonstration Program
POC	pipe overpack container
Pu	plutonium
QA	quality assurance
QAO	quality assurance objective
R	roentgen
RDS	radioassay data sheet
REDC	Radiochemical Engineering and Development Center
RH	remote-handled
RSD	relative standard deviation
RTR	real-time radiography
SCG	summary category group
SME	Subject-Matter Expert
SNF	spent nuclear fuel
SPM	Site Project Manager
Sr	strontium
SRS	Savannah River Site
TAAC	TRU Alpha Activity Concentration
T1	Tier 1
T2	Tier 2
TMU	total measurement uncertainty
TRU	transuranic
TWPC	Transuranic Waste Processing Center
U	uranium
VE	visual examination
VEE	Visual Examination Expert

VPM	vendor project manager
WAC	Waste Acceptance Criteria
WDS	Waste Data System
WG	weapons grade
WIPP	Waste Isolation Pilot Plant
WMC	waste matrix code
WMP	waste material parameter
WSPF	waste stream profile form
WWIS	WIPP Waste Information System

1.0 EXECUTIVE SUMMARY

This report supports the U.S. Environmental Protection Agency's (EPA's) determination that the waste characterization program at the U.S. Department of Energy's (DOE's) Oak Ridge National Laboratory (ORNL) continues to be in compliance with applicable EPA requirements in the Code of Federal Regulations (CFR) at 40 CFR part 194. In accordance with 40 CFR 194.24(h), the EPA conducts continued compliance inspections of EPA-approved transuranic (TRU) waste characterization systems used at the TRU waste sites operated by the DOE.

Since 2008 the Central Characterization Program (CCP), a mobile waste characterization systems provider, has operated a waste characterization program for both contact-handled (CH) and remote-handled (RH) TRU wastes at the Transuranic Waste Processing Center (TWPC) at ORNL in Oak Ridge, Tennessee. For budgetary reasons, the DOE suspended TRU waste characterization activities at ORNL from June 2011 to October 2013. The EPA performed a continued compliance inspection in February 2014 and determined that ORNL-CCP had resumed regulatorily compliant waste characterization activities of TRU wastes intended for disposal at the Waste Isolation Pilot Plant (WIPP) (EPA Docket No. A-98-49; II-A4-186; EPA Air E-Docket No. EPA-HQ-OAR-2001-0012-0280). The EPA subsequently conducted a continued compliance inspection of the ORNL-CCP TRU waste characterization program in 2016 (EPA Docket No. A-98-49; II-A4-207; EPA Air E-Docket No. EPA-HQ-OAR-2001-0012-0470) and determined that the ORNL-CCP CH and RH TRU waste characterization programs continued to be in compliance with the approvals described in the baseline, Tier 1 (T1) and continued compliance inspection reports.

On March 6–8, 2018, the EPA conducted another continued compliance inspection of ORNL-CCP's CH and RH TRU waste characterization program in Oak Ridge, Tennessee. During this inspection, the EPA evaluated aspects of the following waste characterization activities:

- Acceptable knowledge (AK) for CH and RH TRU waste streams.
- Two nondestructive assay (NDA) systems for characterizing CH TRU waste: the IQ3 system and the Mobile In-Situ Object Counting System (ISOCS) Large Container Counter 2 (MILCC2).
- Gamma and neutron dose-to-curie (DTC) for RH TRU wastes.
- Real-time radiography (RTR) for CH TRU waste.
- Visual examination (VE) for CH and RH TRU wastes.

Based on the results of this continued compliance inspection, the EPA confirms that the ORNL-CCP CH and RH TRU waste characterization program operates in a manner consistent with prior EPA approvals and limitations described in the baseline inspection reports (see EPA Docket Nos. A-98-49; II-A4-103; EPA Air E-Docket No. EPA-HQ-OAR-2008-0449-0004, dated August 21, 2008, and A-98-49; II-A4-111; EPA-HQ-OAR-2008-0820-0004, dated February 3, 2009) and subsequent EPA continued compliance and T1 approvals. Tables A-1 and A-2 in Attachment A summarize the EPA's approvals of the ORNL-CCP CH and RH TRU waste characterization programs.

Based on this inspection, there is one change to the CH AK T1 designations and one change to the CH and RH AK Tier 2 (T2) designations, as shown in Tables 1 and 2. On July 14, 2017, the EPA published a Federal Register notice (82 FR 32542) announcing the EPA's intent to eliminate the distinction between retrievably-stored and newly-generated TRU waste destined for disposal at the WIPP. The EPA did not receive any comments on this change; therefore, the EPA is removing the newly-generated T1 requirement from the ORNL-CCP CH AK T1 designations (see Table 1).

Notification to the EPA upon completion of or substantive modification to basis of knowledge (BoK) memoranda is a new T2 requirement. The EPA also added additional explanatory footnotes to both Table 1 and Table 2 to clarify some of the T2 change designations. Tables 1 and 2 show the T2 changes for CH and RH in **bold** text. T1 and T2 changes that were initiated during the CH and RH baselines and subsequent changes remain in effect. The language in Tables 1 and 2 regarding AK documentation applies to all ORNL-CCP waste streams. The EPA will continue to make clarifying and editorial changes to the tiering tables as necessary. This table may be revised prior to the next inspection (continued compliance or T1 change approval) if the EPA concludes that CCP-program-wide changes to the tiering requirements are necessary.

The EPA did not identify any findings or concerns during this inspection. ORNL-CCP revised several documents during the inspection and provided them to the EPA. Attachment J is a list of all documentation reviewed, including batch data reports.

This report serves as the EPA's public notification of the results of the continued compliance inspection. This information will be provided through the Agency's general WIPP docket at regulations.gov (Docket ID#: EPA-HQ-OAR-2001-0012-0478). A summary of all WIPP-related EPA inspection statuses can also be found at <https://www.epa.gov/radiation/waste-isolation-pilot-plant-wipp-inspections>, and any interested party can get these and other WIPP updates via the WIPP-NEWS e-mail listserv (https://www.epa.gov/radiation/wipp-news).

Table 1. Tiering of Contact-Handled Transuranic Waste Characterization Processes Implemented by ORNL-CCP (Based on November 13–15, 2007, Baseline Inspection and Subsequent Inspections and Evaluations, Updated May 2018)

Process Elements	ORNL-CCP CH Waste Characterization Process – T1 Changes	ORNL-CCP CH Waste Characterization Process – T2 Changes*
Acceptable Knowledge, including Load Management	Any new waste category other than retrievably stored debris, soils/gravel and solids (i.e., any type of newly generated waste) Load management	Submission of a list of active ORNL-CCP CH AKEs and SPMs Notification to the EPA upon completion of or substantive modification** to: • AK accuracy reports (annually, at a minimum) • AK-AK and AK-NDA/NDE Discrepancy Resolution Reports • WSPFs and related attachments (e.g., CIS) for all new or modified waste streams, including change notices† • AKSRs (new and updated versions) • CCP-TP-005, Attachments 4, 6, 7, 8, and 9 and/or associated memoranda, including "Add Container" memoranda‡ • Site AK procedures requiring CBFO approval⁂ • Enhanced AK documents such as IWMDL forms and AK assessment, CCE **and BoK memoranda**
Nondestructive Assay	New equipment or substantive physical modifications** to approved equipment Extension of or changes to approved calibration range for approved equipment Relocation of MILCC2 onsite or other activities that require system recalibration Addition of new measurement configurations or container types	Submission of a list of ORNL-CCP NDA operators, EAs and ITRs that performed work during the previous quarter Notification to the EPA upon substantive modification** to: • Software for approved equipment • Operating ranges upon CBFO approval • Site NDA procedures requiring CBFO approval⁂ Notification to the EPA upon successful calibration verification of MILCC2 following on-site relocation or other equipment changes
Real-Time Radiography	None	Submission of a list of ORNL-CCP RTR operators and ITRs that performed work during the previous quarter Notification to the EPA upon: • New equipment or substantive physical modifications** to approved equipment • Substantive modification** to site RTR procedures requiring CBFO approval⁂
Visual Examination and Visual Examination Technique	Use of VE to characterize homogenous solid CH TRU waste (SCG 3000)	Submission of a list of ORNL-CCP VE operators, VE Experts and ITRs that performed work during the previous quarter
WIPP Waste Data System	Load management	Notification to the EPA upon substantive modification** to site WDS procedures requiring CBFO approval⁂

New T1s, T2s and significant modifications to existing T1s or T2s are in **bold** text; T1s or T2s that were only revised for style are not shown in bold. Changes in strikethrough are no longer relevant but are retained for completeness purposes.

* ORNL-CCP will report all T2 changes to the EPA every three months.

** "Substantive modification" refers to a change with the potential to affect ORNL-CCP's CH waste characterization processes or documentation of them, excluding changes that are solely related to the environment, safety and health; nuclear safety; or the Resource Conservation and Recovery Act; or that are editorial in nature or are required to address administrative concerns. The EPA may request copies of new references that the DOE adds during a document revision.

† **Updates to the related attachments alone is not intended to be a T2 change; the T2 change refers to the WSPF and any change notices. The attachments should be provided with the WSPF/change notices if such documents are requested by the EPA.**

‡ **Substantive change for these CCP-TP-005 attachments refers to changes in the contents of the attachment or revision of the associated memorandum (e.g., Waste Material Parameters and Nondestructive Assay memoranda). The EPA does not require notification every time an attachment is signed if there are no changes.**

⁂ **Site procedures include any procedures used by ORNL-CCP personnel that require CBFO approval. This includes ORNL-CCP-specific procedures as well as applicable CCP-wide procedures.**

Table 2. Tiering of Remote-Handled Transuranic Waste Characterization Processes Implemented by ORNL-CCP (Based on June 30–July 2, 2008, Baseline Inspection and Subsequent Inspections and Evaluations, Updated May 2018)

Process Elements	ORNL-CCP RH Waste Characterization Process – T1 Changes	ORNL-CCP RH Waste Characterization Process – T2 Changes*
Acceptable Knowledge	Any new waste streams not approved under the baseline Modification of the approved population of the OR-REDC-RH-HET wastes to include any containers not included in the CCP-AK-ORNL-501, Revision 3 analysis Substantive modification† to the AKSR (e.g., CCP-AK-ORNL-500), certification test plan (e.g., CCP-AK-ORNL-502), correlation and surrogate summary form, AK accuracy report and waste stream profile form Implementation of load management	Submission of a list of active ORNL-CCP RH AKEs and SPMs Notification to the EPA upon availability of or nonsubstantive modification** to: • AKSRs and certification test plans (e.g., CCP-AK-ORNL-500, CCP-AK-ORNL-502) • Correlation and surrogate summary form • AK accuracy reports (annually, at a minimum) • The waste stream data package for waste streams and any modifications to the WSPF, including the CRR and CIS*** Notification to EPA upon availability of or substantive modification† to: • CCP-AK-ORNL-002 • Add container memoranda • DRs or information pertaining to limits on uses of historical data • Site AK procedures requiring CBFO approval‡ • Enhanced AK documents such as IWMDL forms and AKA, CCE **and BoK memoranda**. • Documentation of RH samples reclassified as CH and subject to confirmatory analyses via NDA⁂
Radiological Characterization, including Dose-to-Curie	Application of new scaling factors for isotopic determination other than those documented in CCP-AK-ORNL-501, Revision 3 Use of any alternate radiological characterization procedure other than DTC, with established scaling factors as documented in CCP-TP-504 Any new waste stream not approved under the baseline or addition of containers to Waste Stream OR-REDC-RH-HET that requires changing the established radionuclide scaling factors in CCP-AK-ORNL-501, Revision 3 Substantive modification† of EPA-approved procedures or radiological characterization technical reports (e.g., CCP-TP-504, CCP-AK-ORNL-501)	Submission of a list of ORNL-CCP DTC operators, EAs and ITRs that performed work during the previous quarter Notification to the EPA upon: • Nonsubstantive modification** to procedures or radiological technical reports (e.g., CCP-TP-504, CCP-AK-ORNL-501) requiring CBFO approval • Results from any RH TRU containers that qualify as CH and are subject to NDA
Visual Examination	Implementation of VE by any system other than two operators performing VE (i.e., viewing a previously recorded VE event)	Submission of a list of ORNL-CCP VE operators, VE Experts and ITRs that performed work during the previous quarter

Process Elements	ORNL-CCP RH Waste Characterization Process – T1 Changes	ORNL-CCP RH Waste Characterization Process – T2 Changes*
		Notification to the EPA upon: • Substantive modification† to site VE procedures requiring CBFO approval • Characterization of SCG S3000 or S4000 RH waste by an approved process
Real-time Radiography	Any use of real-time radiography	
WIPP Waste Data System	None	Notification to the EPA upon substantive modification† to: • Site WDS procedures requiring CBFO approval • The Excel spreadsheet titled WWIS Data Entry Summary Characterization and Certification

New T1s, T2s and significant modifications to existing T1s or T2s are in **bold** text; T1s or T2s that were only revised for style are not shown in bold.

* ORNL-CCP will report all unmarked T2 changes to the EPA every three months.

**** "Nonsubstantive modification" refers to any change or modification, including those meeting the definition below for "substantive modification."**

***** Updates to the CRR and CIS are not intended to be T2 changes; the T2 change refers to the WSPF package as a whole.**

† "Substantive modification" refers to a change with the potential to affect ORNL-CCP's RH waste characterization processes or documentation of them, excluding changes that are solely related to the environment, safety and health; nuclear safety; or the Resource Conservation and Recovery Act; or that are editorial in nature or are required to address administrative concerns. The EPA may request copies of new references that the DOE adds during a document revision.

‡ **Site procedures include any procedures used by ORNL-CCP personnel that require CBFO approval. This includes ORNL-CCP-specific procedures as well as applicable CCP-wide procedures.**

⁂ This T2 change was a one-time requirement for provision to the EPA of a formal document describing the selection of samples for confirmatory testing to confirm RH radiological modeling. The requirement has been fulfilled and no further action relative to this requirement is expected.

2.0 PURPOSE OF CONTINUED COMPLIANCE INSPECTIONS

Under the changes to 40 CFR 194.8 promulgated in the July 16, 2004, Federal Register notice, the EPA must perform a baseline inspection of a TRU waste generator site's waste characterization program (69 FR 42571, July 16, 2004). The purpose of the EPA's baseline inspection is to approve the site's waste characterization program, based on a 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.

Following the EPA's baseline approval, the EPA has the authority to conduct continued compliance inspections to verify that the site (1) continues to use only the approved waste characterization processes to characterize the waste, and (2) remains in compliance with all the regulatory requirements in 40 CFR 194. The EPA is also authorized to evaluate and approve changes (i.e., tiering changes), if necessary, to the site's approved waste characterization program by conducting additional inspections under the authority of 40 CFR 194.24(h).

The EPA performs periodic continued compliance inspections of each TRU waste characterization program, covering all elements of the programs, including the common elements of waste characterization processes that are not expected to significantly vary by waste stream. Examples of the common characterization elements are personnel training, procedures and equipment capabilities. The EPA will consider the results of continued compliance inspections when setting the scope and evaluating site-specific T1 changes.

The results of this continued compliance inspection and the review of quarterly T2 changes will be the basis for the EPA's evaluation of any future ORNL-CCP T1 change requests submitted and the next EPA continued compliance inspection. Thus, the EPA can focus on those waste characterization components that are critical to the specific T1 change request, evaluation and approval (e.g., waste-stream-specific AK records).

3.0 INSPECTION PERSONNEL

The EPA and its support personnel conducted interviews with ORNL-CCP waste characterization personnel in several disciplines. The personnel contacted represented a sample of the CH and RH TRU waste characterization staff. The EPA inspection team and ORNL-CCP personnel contacted are listed in Attachment B, with their affiliations and areas of expertise or function.

4.0 PURPOSE OF THIS REPORT

This report documents the basis for the EPA's decision to maintain the approval of the ORNL-CCP waste characterization program for CH and RH TRU wastes. Specifically, this report:

- Describes the sample of the ORNL-CCP waste characterization systems evaluated during this inspection.

- Identifies all areas where waste characterization systems have changed relative to what was approved during the baseline inspection and subsequent EPA T1 evaluations and assesses the impact, if any, of those changes.
- Provides objective evidence to support the basis for the EPA's continued approval of applicable waste characterization systems.
- Describes any tests or demonstrations completed during the inspection and their relevance to the EPA's approval decision.

5.0 SCOPE OF THIS CONTINUED COMPLIANCE INSPECTION

The scope of this continued compliance inspection included evaluation of selected elements of the waste characterization systems in use at ORNL-CCP to characterize CH and RH TRU wastes that were approved during the baseline and subsequent continued compliance inspections and T1 evaluations. The waste characterization activities evaluated included AK for a subset of the CH and RH waste streams characterized since the last continued compliance inspection, the IQ3 and MILCC2 NDA systems for CH waste characterization, the gamma and neutron DTC systems for RH waste characterization, RTR operations for CH TRU waste and VE operations for CH and RH TRU waste.

6.0 TECHNICAL EVALUATION

The EPA's technical evaluation is summarized in sections 6.1–6.5 of this report. The details of the EPA's technical evaluation are in the completed inspection checklists, which are included in this report as Attachments C–I. When evaluating future T1 change requests and concurring with quarterly T2 change submissions, the EPA may use these checklists to supplement its review. Attachments D.1 and E.1 contain the results of ORNL-CCP's NDA replicate scanning, as discussed in sections 6.2.1 and 6.2.2, Item (8), of this report. The DOE documents that the EPA reviewed for this evaluation are cited throughout the report and are listed in Attachment J. Any of these documents can be requested from the following address:

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

6.1 Acceptable Knowledge (AK) for Contact-Handled and Remote-Handled Waste Characterization

The EPA evaluated ORNL-CCP's continued compliance with the EPA-approved AK waste characterization program requirements for CH and RH waste characterization. The EPA had previously approved ORNL-CCP's CH AK characterization program for Summary Category Group (SCG) S3000 (homogeneous solids), SCG S4000 (soils) and SCG S5000 (heterogeneous debris) waste. The EPA has approved ORNL-CCP's RH AK characterization program for an approved population of containers in Waste Stream OR-REDC-RH-HET. The EPA conducted the AK portion of a T1 evaluation to expand the approved population of waste in Waste Stream

OR-REDC-RH-HET concurrently with this continued compliance inspection. The aspects of the RH AK review that are within the scope of the T1 evaluation will be documented in the forthcoming T1 evaluation report.

ORNL-CCP's AK process is the same for CH and RH waste streams. The EPA reviewed documents from five CH waste streams and RH Waste Stream OR-REDC-RH-HET as representative of the ORNL-CCP AK waste characterization program. Inspection details and specific documents and records evaluated for each item summarized below are recorded in the AK checklist that is included in Attachment C. The six waste streams sampled during this inspection are listed below in Table 3. The EPA focused this inspection on changes since the last EPA continued compliance inspection of ORNL-CCP in 2016 (see EPA Docket No. A-98-49; II-A4-207; EPA Air E-Docket No. EPA-HQ-OAR-2001-0012-0470).

Table 3. ORNL-CCP Waste Streams Sampled for Review

Waste Stream	AK Summary Report*
OR-NFS-CH-SOIL	001
OR-NFS-CH-HET-A	001
OR-REDC-CH-HET	002
OR-CHEM-CH-HET	005
OR-CRF-CH-HET	013
OR-REDC-RH-HET	500

*The full AK summary report citation for each waste stream is CCP-AK-ORNL-XXX, where XXX represents the numbers indicated in the AK summary report column. For example, the full citation for AK Summary Report 002 is CCP-AK-ORNL-002.

6.1.1 Technical Evaluation: Acceptable Knowledge

(1) The EPA examined personnel training and qualifications and found them to be adequate.

ORNL-CCP provided qualification cards for all AK Experts and Site Project Managers that actively work with the ORNL-CCP waste characterization program. The EPA reviewed the qualification cards provided, as well as documentation showing familiarity of the AK Experts and Site Project Managers with current revisions of relevant procedures and program documents. The EPA also interviewed a portion of the listed AK Experts and Site Project Managers. The EPA has no issues with ORNL-CCP personnel qualifications for AK Experts and Site Project Managers.

Submission to the EPA of a list of AK Experts and Site Project Managers who performed work in these roles for the ORNL-CCP waste characterization program in the previous quarter remains a T2 change (see Tables 1 and 2).

(2) The EPA assessed nonconformance and discrepancy resolution documentation and found it to be adequate.

The EPA evaluated sample discrepancy resolution and AK-related nonconformance reports (NCRs) and found that the discrepancies were adequately documented and resolved. ORNL-CCP

has not generated any AK reevaluation documentation relative to the sample waste streams since the last EPA continued compliance inspection. Based on review of the sample discrepancy resolution report and NCRs, the EPA finds the lack of AK reevaluation documentation to be appropriate.

Notification to the EPA upon completion of or substantive modification to AK-AK and AK-NDA/nondestructive examination (NDE) discrepancy resolution reports remains a T2 change (see Tables 1 and 2).

(3) The EPA assessed documentation of waste stream definitions and waste traceability and found that the definitions are adequately supported, and waste containers are adequately traceable.

The EPA evaluated waste stream definitions documented in four AK summary reports and supported by various source documents and CCP-TP-005 attachments (i.e., Attachment 6, Attachment 7). During this evaluation, the EPA verified the technical adequacy of the documents supporting the following statements and found the discussion and documentation provided to be adequate:

- All waste within a waste stream was generated from a single process or activity.
- All waste within a waste stream is similar in material and physical form, and the expected physical parameters are adequately described.
- All waste within an RH waste stream has similar radiological properties.
- The expected radiological parameters are adequately documented.
- Any use of AK (and associated limitations) in radiological characterization or assay are clearly documented and communicated between AK and NDA/radiological characterization personnel.
- Waste containers assigned to specific waste streams are traceable from generation through characterization and have documentation supporting inclusion in the waste stream.

(4) The EPA evaluated implementation of the enhanced acceptable knowledge process and found it to be adequate.

The enhanced AK process is intended to document (1) evaluation of container-specific AK to provide reasonable assurance that the waste container management and packaging activities are bounded by the applicable AK summary reports, (2) evaluation of waste-stream-specific AK to provide reasonable assurance that all potential chemical incompatibilities have been identified and evaluated for impact to the long-term isolation of TRU waste, and (3) evaluation that the waste either does not contain any oxidizers or the waste meets the treatment criteria established by the Carlsbad Field Office (CBFO) in the BoK for oxidizing chemicals.

ORNL-CCP currently has two ways of documenting the container-specific evaluation: CCP-TP-005, Attachment 9, Interface Waste Management Documents List, for containers packaged by the TWPC since completion of the waste-stream-specific Attachment 9 form (date varies by

waste stream) or an AK assessment memorandum for all other containers not yet emplaced at the WIPP. Each waste stream may have multiple AK assessment memoranda, or the AK Expert may add addenda to an existing AK assessment memorandum to account for additional reviewed containers. ORNL-CCP has generated two AK assessment memoranda and updated AKA001 with Addendum 1 since the last EPA continued compliance inspection (References AKA001, AKA002 and AKA003). CBFO will provide notification of additional AK assessment memoranda as they become available as part of the quarterly T2 change submissions.

The waste-stream-specific evaluation for chemical compatibilities is currently being documented on a chemical compatibility evaluation (CCE) memorandum, with one generated per waste stream. ORNL-CCP had generated two CBFO-approved CCE memoranda at the time of this inspection: one for Waste Stream OR-NFS-CH-SOIL and one for Waste Streams OR-REDC-CH-HET and OR-REDC-RH-HET (References CCE001 and CCE008).

The evaluation of oxidizing potential can be conducted on a container basis or a waste stream basis, as appropriate. ORNL-CCP has generated one BoK evaluation memorandum for Waste Stream OR-NFS-CH-SOIL, concluding that based on the analysis documented in CCE001, the entire waste stream is not subject to the BoK criteria (Reference BOK001).

The EPA found that the container- and waste-stream-specific analyses conducted by ORNL-CCP as part of the enhanced AK process are thoroughly documented, and the process is adequately implemented.

Notification to the EPA upon completion of or substantive modification to enhanced AK documents such as Interface Waste Management Document Lists (i.e., CCP-TP-005, Attachment 9 forms) and AK assessment and CCE memoranda remains a T2 change. Notification to EPA upon completion of or substantive notification to the BoK evaluation memoranda is a new T2 change for CH and RH waste (see Tables 1 and 2).

(5) The EPA evaluated the waste stream certification process and found it to be adequate.

The EPA evaluated samples of the documents commonly associated with Site Project Manager certification of waste streams, including characterization checklists, characterization information summaries, waste stream profile forms, and AK accuracy reports. The EPA found that ORNL-CCP's certification process continues to be adequate and appropriately documented.

Notification to the EPA upon completion of or revisions to all waste stream profile forms and related attachments (e.g., characterization information summaries, summation of aspects), including generation of any change notices, remains a T2 change (see Tables 1 and 2).

Notification to the EPA upon completion of or substantive modification to AK accuracy reports (annually, at a minimum) also remains a T2 change (see Tables 1 and 2).

(6) The EPA evaluated the certification plan and identification of data quality objectives in the certification plan and found them to be adequate.

EPA has approved one RH waste stream for characterization by ORNL-CCP and has reviewed the documentation associated with Waste Stream OR-REDC-RH-HET several times. ORNL-

CCP has not revised the certification plan (CCP-AK-ORNL-502) since the last EPA inspection despite expanding the population of waste in Waste Stream OR-REDC-RH-HET. However, the description of how the data quality objectives will be met continues to be applicable to the whole waste stream. The waste certification plan is written near the beginning of the characterization process to describe the methods selected to generate characterization data and qualify AK data used to meet the data quality objectives, along with a description of the quality assurance objectives and how they were met for each of those methods. The certification plan is intended to be a planning document, and ORNL-CCP does not update the certification plan as more waste is added or the applicable characterization methods change. The EPA found documentation of the certification plan and data quality objectives to be adequate.

Notification to the EPA upon nonsubstantive modification to the certification plan remains a T2 change (see Table 2).

(7) The EPA evaluated ORNL-CCP's overall system of controls and found them to be adequate.

The EPA evaluated ORNL-CCP's compliance with the AK T1 requirements, completeness of the sampled AK summary reports, and general compliance with the AK procedure as evidenced by successful completion of the required attachments.

The EPA found that ORNL-CCP has submitted appropriate T1 change requests as necessary. ORNL-CCP has also adequately completed CCP-TP-005 attachments as necessary. The AK summary reports are also complete and adequate.

The WIPP Land Withdrawal Act (Public Law 102-579) as amended by Public Law 104-201 identifies that waste identified for emplacement at the WIPP must be defense in origin, must not be spent nuclear fuel and must not be high-level waste.[1] The EPA received sample AK summary reports. In these documents, the DOE states that the waste has a defense origin and does not contain spent nuclear fuel or high-level waste.

Notification to the EPA upon completion of or substantive modification to CCP-TP-005, Attachments 4, 6, 7 and 8 and associated memoranda, remains a CH T2 change (see Table 1).

Notification to the EPA upon completion of or a non-substantive modification to the correlation and summary surrogate form (CSSF) remains an RH T2 change (see Table 2).

Notification to the EPA upon completion of or revisions to all AK summary reports remains a T2 change (see Tables 1 and 2).

(8) The EPA evaluated compliance with Tier 2 reporting requirements and found it to be adequate.

T2 notification to the EPA upon completion of or modification to the waste-stream-specific documents listed in Tables 1 and 2 is required on a quarterly basis. The EPA compared the

[1] See WIPP Land Withdrawal Act Section 2(10), (15), referring to the Nuclear Waste Policy Act of 1982, 42 U.S.C. § 10101.

revision dates of documents evaluated during this continued compliance inspection with the T2 notification reports provided to the EPA by CBFO since the 2016 continued compliance inspection. In general, the EPA found that ORNL-CCP is providing T2 notification as required.

The tiering changes identified during the ORNL-CCP CH and RH baseline inspections and subsequent T1 inspections remain in effect and are included in Tables 1 and 2 of this document.

6.1.2 Acceptable Knowledge Findings and Approval

Summary of Acceptable Knowledge Findings and Concerns

The EPA did not identify any findings or concerns related to AK during this continued compliance inspection.

Acceptable Knowledge Approval

There are no changes to the T1 designations for CH or RH AK as a result of this continued compliance inspection. The EPA removed the CH T1 requirement for newly-generated waste from the tiering table at the conclusion of the public comment period initiated by Federal Register notice on July 14, 2017 (82 FR 32542). Notification to the EPA upon completion of or substantive modification to the BoK evaluation memoranda is a new T2 requirement (see Tables 1 and 2). The language in Tables 1 and 2 regarding AK documentation applies to all ORNL-CCP waste streams, unless specifically stated otherwise.

Based on the results of this evaluation and the data examined, the EPA determines that ORNL-CCP demonstrated continued AK characterization compliance.

6.2 Nondestructive Assay (NDA) for Contact-Handled Waste Characterization

ORNL-CCP operates two NDA systems at the TWPC for assaying CH TRU wastes, the IQ3 gamma system and the Mobile ISOCS Large Container Counter-2 or MILCC2 gamma system, also known as the “Oak Ridge MILC Counter” in some ORNL-CCP documents. Both systems assay 55-gallon drums based on gamma emissions, although the MILCC2 has a wider range of conditions under which it can produce valid assay data. The EPA observed both systems in operation at the TWPC and inspected records and interviewed ORNL-CCP NDA personnel.

6.2.1 Technical Evaluation: Mobile Characterization Services IQ3 System

The EPA evaluated the following aspects of the IQ3 system during this inspection. Details regarding the objective evidence observed for these aspects can be found in Attachment D.

(1) The IQ3 nondestructive assay system is the same system that the EPA approved previously.

The IQ3 system is housed in trailer number NDA-IQ3-01, located in Building 7880 MM[2] at the TWPC at ORNL. This system has not been moved since the EPA's initial approval in February 2010 and subsequent inspections in 2014 and 2016, during which it was confirmed that it is the same system approved previously for assaying CH TRU waste. The EPA also confirmed that only minor, maintenance-related changes had been made to the IQ3 system, discussed in Item (3) below.

The EPA did not identify any concerns regarding the identity and previous approval of the ORNL-CCP IQ3 NDA system.

(2) The EPA assessed the design and operational range of the IQ3 system and found them to be adequate for the wastes currently being assayed.

The EPA determined that the design and operational range of the IQ3 system were unchanged since the baseline approval and subsequent inspections. The IQ3 is a six-detector system with three broad energy germanium (BEGe) detectors for quantitative assays and three planar detectors for isotopic information. The system's calibration range for density was 0.015–1.64 grams per cubic centimeter (g/cc), adequate for the CH TRU wastes assayed at ORNL-CCP. The activity range is expressed in gamma (photon) energy, with no stated limits in terms of nuclear material mass, provided all spectral aspects are acceptable. The IQ3's operating ranges for density and activity were consistent with the system's design and were unchanged from previous EPA inspections.

Since the 2016 EPA continued compliance inspection, the ORNL-CCP IQ3 has assayed 377 drums, which are compiled into a total of 96 batch data reports. Some of these drums are determined to not qualify as TRU post assay. The EPA confirmed that the IQ3 system assays only 55-gallon drums and will not be used to assay other container types without prior notification of and inspection by the EPA. The EPA reviewed several IQ3 system batch data reports and IQ3 system logbook entries and found that assays, daily performance checks and background measurements were adequately documented.

The EPA did not identify any concerns regarding the design and operational range of the IQ3 NDA system.

(3) ORNL-CCP performed and documented system calibration, calibration confirmation and verifications of the IQ3 system, as required.

The EPA reviewed the calibration of record and calibration confirmation for the IQ3 system and found them to be technically adequate and unchanged from the baseline approval and subsequent inspections. The sources used for calibration and calibration confirmation are all traceable to the

[2] This was formerly called the Canberra Trailer but is now called the Mirion Trailer, to reflect a recent change in company ownership. In many IQ3 documents, the term "Canberra" has been changed to "Mirion." although the contents of the documents are unchanged.

national standards base, as documented in the 2014 calibration and calibration confirmation reports.

ORNL-CCP completed five calibration verifications for the IQ3 system since the 2016 EPA continued compliance inspection, as follows:

- The IQ3 was taken out of service on November 15, 2016, due to spectral degradation. ORNL-CCP replaced BEGe Detector No. 3 and repaired a planar detector. Upon completion of these activities, ORNL performed the calibration verification on December 8, 2016, and all performance criteria were acceptable, allowing the IQ3 to be returned to service.

- The IQ3 was taken out of service in February 2017 due to spectral degradation. ORNL-CCP replaced BEGe Detector No. 2. Upon completion, ORNL performed the calibration verification on March 28, 2017, and all performance criteria were acceptable, allowing the IQ3 to be returned to service.

- The IQ3 was brought back into operation on August 24, 2017, following an approximately two-month period of being out of service for a problem with the liquid nitrogen transfer equipment that allowed the detectors to thermal cycle.[3] Upon repairing the problem and cooling the detectors, ORNL performed the calibration verification on April 24, 2017, and all performance criteria were acceptable, allowing the IQ3 to be returned to service.

- The IQ3 was taken out of service on September 18, 2017, due to a problem with BEGe Detector No. 2. ORNL-CCP replaced this detector and performed the calibration verification on September 21, 2017, and all performance criteria were acceptable, allowing the IQ3 to be returned to service.

- On January 3, 2018, a waste drum unexpectedly tipped over inside the IQ3 assay chamber, and the IQ3 was taken out of service. ORNL-CCP determined that the problem was due to a misalignment of the drum's path into the assay chamber. ORNL repaired the IQ3 and performed the calibration verification on February 26, 2018, and all performance criteria were acceptable, allowing the IQ3 to be returned to service.

All five calibration verifications described above met the requirements for accuracy and precision specified in DOE/WIPP-02-3122, DOE's Waste Acceptance Criteria (WAC)[4]; i.e., 90–110 percent recovery (%R) and percent relative standard deviation (%RSD) <6% for three replicates, respectively. ORNL-CCP NDA personnel use controlled-copy procedures for the calibration, performance checks, routine operation, and review/validation of data for the IQ3 system (see Attachment D).

[3] Germanium detectors typically operate at liquid nitrogen temperatures (~-330° F) and allowing them to warm to ambient temperature can be harmful to the detectors. This is referred to as "thermal cycling" and generally requires measurement to verify that the detectors are performing adequately.

[4] Revision 8.0 to DOE/WIPP-02-3122 went into effect on July 5, 2016, requiring 90–110% limits for %R that replaced the previous %R limits of 70–130%.

The EPA did not identify any concerns regarding the system calibration, calibration confirmation and verifications of the IQ3 NDA system.

(4) Determination and documentation for the total measurement uncertainty for the IQ3 system are adequate.

Total measurement uncertainty (TMU) for IQ3 system assays is documented in ORNL-CCP report CI-MILCC2-NDA-1002, Revision B. The EPA verified that ORNL-CCP had not make any substantive changes to this report and that the TMU values in the IQ3 system batch data reports that the EPA reviewed (see Attachment D) were consistent with expectations based on the TMU report.

The EPA did not identify any concerns regarding the technical adequacy and documentation of TMU for the IQ3 NDA system.

(5) ORNL-CCP adequately determined and documented the lower limit of detection of the IQ3 system, as required.

The EPA reviewed the IQ3 system calibration confirmation report, which documents the lower limit of detection (LLD) for the system. The EPA determined that the LLD is adequately documented, and that the IQ3 system can discriminate between TRU and non-TRU wastes at the 100 nanocurie per gram (nCi/g) criterion.

The EPA did not identify any concerns regarding the technical adequacy and documentation of the LLD for the IQ3 NDA system.

(6) The IQ3 system participated successfully in drum Cycle 24A of the CBFO-sponsored performance demonstration program, as required.

The IQ3 system assayed two Performance Demonstration Program (PDP) drums for Cycle 24A: a combustible matrix drum and a glass matrix drum. ORNL-CCP provided the CBFO scoring report for this cycle to the EPA, indicating that the IQ3 system passed all criteria for the two matrices assayed.

The EPA did not identify any concerns regarding the IQ3 NDA system's participation in the CBFO-sponsored PDP.

(7) The EPA assessed personnel training and found it to be adequate.

All ORNL-CCP NDA personnel currently associated with the calibration, operation and data review and approval of the IQ3 system had current training in all applicable areas, as evidenced by the list of qualified individuals (LOQI) for a span of dates that the EPA reviewed for this inspection.

The EPA did not identify any concerns regarding training for ORNL-CCP personnel associated with the IQ3 NDA system.

(8) ORNL-CCP performed the EPA replicate testing of the IQ3 system. The EPA evaluated the results and found them to comply with the criteria for the Environmental Protection Agency Replicate Testing Protocol.

The purpose of the replicate testing is to provide the EPA with an independent means to verify that the IQ3 system can provide reproducible results for the determination of the quantity of 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 the TRU alpha concentrations and their associated uncertainties.[5]

The EPA requested that ORNL-CCP reassay three drums that the EPA randomly selected from a list of drums previously assayed on the IQ3 system: Drum Nos. X10C0901944, X10C0301194D and X10C9402644C. ORNL-CCP reassayed each drum five times and compared the results of the five reassays to the original assay. During the onsite inspection at ORNL-CCP, the EPA witnessed ORNL-CCP perform the fourth of the five replicate assays for Drum No. X10C9402644C on the IQ3.

ORNL-CCP performed two statistical tests on the resultant data: a chi-squared (χ^2) test and a *t* test. The χ^2 test, which is also known as the goodness-of-fit test or the chi-squared test for independence, is used to show how observed data compare with what is expected according to a specific hypothesis. The EPA uses this test to show whether the replicate measurements differed from the expected original measurement. The *t* test is a statistical tool that is used to tell if two sets of data are statistically different; the EPA uses this test to determine if there are statistically significant differences between the original assay values and the average of the five replicates. The EPA reviewed the data and results of these tests, which are included in Attachment E.1 and evaluated in detail below.

Drum No. X10C0901944

The χ^2 test for Drum No. X10C0901944 showed that the observed variances in the replicate measurements are less than or equal to the reported uncertainties within the statistical limits of the χ^2 test. The *t* test for Drum No. X10C0901944 showed no statistically significant differences between the original assay values and the average of the five replicate measurements.

Drum No. X10C0301194D

The χ^2 test for Drum No**.** X10C0301194D showed that the observed variances in the replicate measurements are less than or equal to the reported uncertainties within the statistical limits of the χ^2 test.

The *t* test for Drum No. X10C0301194D indicated a "Highly Significant" value for ^{241}Am, ^{90}Sr, ^{137}Cs and ^{242}Pu. The TRU Alpha Activity Concentration (TAAC) of the original assay was 110 nCi/g, while the average of the replicate analyses was 122 nCi/g, a difference of approximately 11%, not a statistically significant difference.

[5] Revision 2 of the Environmental Protection Agency Replicate Testing Protocol provides the details of the replicate testing assay protocol and data evaluation.

The original activity reported for ^{241}Am was 7.01 microcuries (µCi) compared to 10.4 µCi, the average of the five replicate analyses. The five replicate ^{241}Am values show a very tight grouping (10.5, 10.3, 10.4, 10.4 and 10.5 µCi), with corresponding tightly grouped measurement uncertainties (0.0214, 0.0210, 0.0212, 0.0212 and 0.0215 µCi) and a small standard deviation of 0.00837 µCi. By design, the *t* test penalizes the high precision of the replicates and identifies a small actual difference between the tightly-grouped replicates and the original assay as a failure. This is more a limitation of the *t* test than an actual measurement issue. The location and movement of waste drums in the Contact Handled Storage Area (CHSA), adjacent to the IQ3 trailer, could also produce fluctuations in the ^{241}Am background.

Since the ^{90}Sr value is based on the measured ^{137}Cs, both radionuclides show the same result for the *t* test. As discussed for ^{241}Am, the five replicate ^{137}Cs values show a very tight grouping (1.67, 1.68, 1.68, 1.68 and 1.68 µCi), with corresponding tightly grouped measurement uncertainties (0.0335, 0.0336, 0.337, 0.0336 and 0.0336 µCi) and a small standard deviation of 0.000447 µCi. As discussed for ^{241}Am, the *t* test penalizes the high precision of the replicates and identifies a small actual difference between the tightly-grouped replicates and the original assay as a failure. This is more a limitation of the *t* test than an actual measurement issue. The location and movement of waste drums in the CHSA could also produce fluctuations in the ^{137}Cs background.

The value for ^{242}Pu is derived from the measured values for ^{238}Pu, ^{239}Pu, ^{240}Pu and ^{241}Pu. The Highly Significant flag for ^{242}Pu was based on comparing the 2 nCi average value for the five replicates to the original value, which was reported as zero. Both the original value and the average of the five replicates are close to the system's ^{242}Pu detection limit for this container, which is flagged as a failure in the *t* test. This change from the original measurement could also be attributed to changes in the gamma background due to nearby drum activities at the CHSA.

Drum No. X10C9402644C

The χ^2 test for Drum No. X10C9402644C showed that the observed variances in the replicate measurements are less than or equal to the reported uncertainties within the statistical limits of the χ^2 test.

The *t* test for Drum No. X10C9402644C indicated a Highly Significant value for ^{90}Sr and ^{137}Cs. The TAAC of the original assay was 123 nCi/g, while the average of the replicate analyses was 117 nCi/g, a difference of approximately 5%, not a statistically significant difference.

In the *t* test results for Drum No. X10C9402644C, the five replicate ^{137}Cs values show a very tight grouping (414, 414, 414, 414 and 413 µCi), with corresponding tightly grouped measurement uncertainties (724, 723, 724, 724 and 722 µCi) and a small standard deviation of 0.0447 µCi. As discussed for ^{241}Am, ^{90}Sr and ^{137}Cs, the *t* test penalizes the high precision of the replicates and identifies a small actual difference between the tightly grouped replicates and the original assay as a failure. This is more a limitation of the *t* test than an actual measurement issue. The location and movement of waste drums in the CHSA could also produce fluctuations in the ^{137}Cs background.

The EPA had no concerns about replicate testing for the IQ3 NDA system.

6.2.2 Technical Evaluation: Mobile Characterization Services MILCC2 System

The EPA evaluated the following aspects of the MILCC2 system during this inspection. Details regarding the objective evidence observed for these aspects can be found in Attachment E.

(1) The MILCC2 nondestructive assay system is the same system that was approved previously.

The MILCC2 instrument is located in Building (trailer) 7880AC at the TWPC at ORNL. The EPA confirmed that this is the same system that the EPA approved previously. This system has not been moved since the EPA's initial approval in 2014 and subsequent inspection in 2016, during which it was confirmed that it is the same system approved previously for assaying CH TRU waste. The EPA also confirmed that only minor, maintenance-related changes had been made to the MILCC2 system, discussed in Item (3) below.

The EPA did not identify any concerns regarding the identity and previous approval of the ORNL-CCP MILCC2 NDA system.

(2) The EPA assessed the design and operational range of the MILCC2 system and found them to be adequate for the wastes currently being assayed.

The density range of the MILCC2 system calibration is 0–2.5 g/cc, which adequately covers the physical aspects of the ORNL-CCP waste streams that the MILCC2 system assays. The activity range for the MILCC2 is expressed in gamma (photon) energy, with no stated limits in terms of nuclear material mass, provided all spectral aspects are acceptable. The MILCC2's operating ranges for density and activity were consistent with the system's design and were unchanged from previous EPA inspections.

Since the 2016 EPA continued compliance inspection, the ORNL-CCP MILCC2 has assayed approximately 660 drums, which are compiled into a total of 66 batch data reports. The majority of drums qualified as TRU post assay. The EPA reviewed several MILCC2 system batch data reports and logbook entries and found that the MILCC2 system assays, daily performance checks and background measurements were adequately documented. MILCC2 system personnel used current revisions of the operating procedure CCP-TP-076, Revision 2.

The EPA did not identify any concerns regarding the design and operational range of the MILCC2 NDA system.

(3) ORNL-CCP performed and documented system calibration and calibration confirmation of the MILCC2 system, as required.

ORN-CCP had calibrated the MILCC2 and confirmed the calibration, as documented in CI-MILCC2-NDA-1001, Revision A.[6] The EPA verified that the MILCC2 system has not been

[6] ORNL-CCP provided CI-MILCC2-CAL-NDA-1003, Calibration Confirmation Report for Measurements of 6" and 12" Pipe Overpack Containers Using the MCS MILCC2, Revision 0, February 11, 2015, which supports the MILCC2 calibration for pipe overpack containers, a measurement geometry that the EPA has not approved.

recalibrated nor has ORNL-CCP confirmed the MILCC2 calibration since the EPA's last evaluation in 2016, and that these aspects of the MILCC2 were adequate.

ORNL-CCP had performed one calibration verification since 2016, which is documented in CI-MILCC2-NDA-1009. The MILCC2 was taken out of service in November 2017 due to a three-sigma failure for peak shape, documented in ORNL NCR No. NCR-ORNL-0414-16. Additionally, two germanium detectors failed, one in November 2017 and one in December 2017, both due to thermal cycling, as discussed in 6.2.1 Item (3), above. Both detectors were returned to the factory for repairs, and a calibration verification was performed to support returning the MILCC2 to service. The EPA determined the documentation for the calibration verification was adequate and demonstrated that the MILCC2 system met the requirements for accuracy and precision, 90–110 %R and %RSD <6.6% for three replicates, respectively, as required by Revision 8 to the CBFO Waste Acceptance Criteria.

The EPA did not identify any concerns regarding the system calibration and calibration confirmation of the MILCC2 NDA system.

(4) Determination and documentation for the total measurement uncertainty for the MILCC2 system are adequate.

TMU for MILCC2 system assays is documented in the ORNL report, CI-MILCC2-NDA-1002, Revision B, which had been revised twice since its initial issue in 2014 but was unchanged since the 2016 EPA inspection. The most recent revision added an addendum to discuss TMU for pipe overpack containers, a sample container that is not currently approved for MILCC2 assays. The TMU values in the MILCC2 system batch data reports were consistent with expectations based on the TMU report.

The EPA did not identify any concerns regarding the technical adequacy and documentation of TMU for the MILCC2 NDA system.

(5) ORNL-CCP determined and documented the lower limit of detection of the MILCC2 system, as required.

The EPA reviewed the MILCC2 calibration report, CI-MILCC2-NDA-1001, Revision A which documents the technical derivation of typical LLDs and reporting thresholds for unmeasured radionuclides for the system. The EPA determined that the LLD values are adequately documented, and that the MILCC2 system can discriminate between TRU and non-TRU wastes at the 100 nCi/g criterion only at the Near-Field position. It is assumed that containers requiring assays at the Mid- or Far-Field positions would have sufficient activity in excess of 100 nCi/g. Matrix-specific reporting thresholds for unmeasured radionuclides are provided for Mid and Far measurement positions.

The EPA did not identify any concerns regarding the technical adequacy and documentation of LLD values for the MILCC2 NDA system.

(6) The MILCC2 system participated in drum Cycle 24A of the CBFO-sponsored performance demonstration program, as required.

The MILCC2 system assayed two PDP drums for Cycle 24A: a combustible matrix drum and a glass matrix drum. ORNL-CCP provided the CBFO scoring report for this cycle to the EPA, indicating that the MILCC2 system passed all criteria for the two matrices assayed.

The EPA did not identify any concerns regarding the MILCC2 NDA system's participation in the CBFO-sponsored PDP.

(7) The EPA assessed personnel training and found it to be adequate.

All NDA personnel associated with the calibration, operation, and data review and approval of the MILCC2 system had current training in the applicable areas, as evidenced by the list of qualified individuals for a variety of relevant dates that EPA reviewed during the inspection.

The EPA did not identify any concerns regarding training for MILCC2 NDA system personnel.

(8) ORNL-CCP performed the EPA replicate testing of the MILCC2 system. The EPA evaluated the results and found them to comply with the criteria for the Environmental Protection Agency Replicate Testing Protocol.

The purpose of the replicate testing is to provide the EPA with an independent means to verify that the MILCC2 system can provide reproducible results for the quantification of the 10 WIPP-tracked radionuclides and the TRU alpha concentrations and their uncertainty.

As part of this inspection, the EPA requested that ORNL-CCP reassay three drums that the EPA randomly selected from a list of drums previously assayed on the MILCC2. ORNL-CCP reassayed Drum Nos. X10C0402918BO1, X10C9312286A and X10C9402644Q five times and compared the replicate results to the original assay. The EPA witnessed the second of five replicate assays of Drum No. X10C9312286A on the MILCC2 during the onsite inspection. Two statistical tests, a chi-squared (χ^2) test and a *t* test, were performed on the results of these assays; results of the statistical analyses are included in Attachment E.2 and are discussed below. The results of these analyses are used in the same manner as described for the IQ3 system in the previous section.

Drum No. X10C0402918BO1

The χ^2 test for Drum No. X10C0402918BO1 showed that the observed variances in the replicate measurements are less than or equal to the reported uncertainties within the statistical limits of the χ^2 test. The *t* test for Drum No. X10C0402918BO1 showed no statistically significant differences between the original assay values and the average of the five replicate measurements.

Drum No. X10C9312286A

The χ^2 test for Drum No. X10C9312286A showed that the observed variances in the replicate measurements are less than or equal to the reported uncertainties within the statistical limits of

the χ^2 test. The *t* test for Drum No. X10C9312286A showed no statistically significant differences between the original assay values and the average of the five replicate measurements.

The *t* test for Drum No. X10C9312286A indicated a Highly Significant value for ^{90}Sr and ^{137}Cs. The TAAC of the original assay was 4,660 nCi/g, while the average of the replicate analyses was 4,674 nCi/g, a difference of approximately 1%, not a statistically significant difference.

Since the ^{90}Sr value is based on the measured ^{137}Cs, both radionuclides show the same result for the *t* test. The five replicate ^{137}Cs values show a very tight grouping (7.08, 7.60, 6.96, 6.78 and 7.09 µCi), with corresponding tightly grouped measurement uncertainties (0.401, 0.387, 0.410, 0.408 and 0.421 µCi) and a small standard deviation of 0.0305 µCi. As discussed in section 6.2.1, Item (8), the *t* test penalizes the high precision of the replicates and identifies a small actual difference between the tightly grouped replicates and the original assay as a failure. This is more a limitation of the *t* test than an actual measurement issue. The location and movement of waste drums near the MILCC2 could also produce fluctuations in the ^{137}Cs background.

Drum No. X10C9402644Q

The χ^2 test for Drum No. X10C9402644Q showed that the observed variances in the replicate measurements are less than or equal to the reported uncertainties within the statistical limits of the χ^2 test.

The *t* test for Drum No. X10C9402644Q indicated a Highly Significant value for ^{90}Sr and ^{137}Cs. The TAAC of the original assay was 909 nCi/g, while the average of the replicate analyses was 919 nCi/g, a difference of approximately 1%, not a statistically significant difference.

Since the ^{90}Sr value is based on the measured ^{137}Cs, both radionuclides show the same result for the *t* test. The five replicate ^{137}Cs values show a very tight grouping (6,740, 6,720, 6,730, 6,720 and 6,700 µCi), with corresponding tightly grouped measurement uncertainties (134, 133, 134, 133 and 133 µCi) and a small standard deviation of 14.8 µCi. As discussed previously, the *t* test penalizes the high precision of the replicates and identifies a small actual difference between the tightly grouped replicates and the original assay as a failure. This is more a limitation of the *t* test than an actual measurement issue. The location and movement of waste drums near the MILCC2 could also produce fluctuations in the ^{137}Cs background.

The EPA did not identify any concerns about replicate testing for the MILCC2 NDA system.

6.2.3 Nondestructive Assay Findings and Approval

Summary of Nondestructive Assay Findings and Concerns

The EPA did not identify any findings or concerns for the IQ3 or MILCC2 NDA systems at ORNL-CCP.

Nondestructive Assay Approval

There are no changes to the T1 or T2 designations for NDA as a result of this continued compliance inspection. Based on the results of this evaluation and the data examined, the EPA

determines that ORNL-CCP demonstrated continued compliance with the EPA-approved waste characterization program for all NDA systems.

6.3 Radiological Characterization for Remote-Handled Waste Characterization

The EPA initially approved the DTC technique during the RH baseline inspection in February 2011 (EPA Docket No. A-98-49; II-A4-111; EPA Air E-Docket No. EPA-HQ-OAR-2008-0820-0004). This was a gamma-based DTC technique, consistent with the techniques observed at other DOE RH TRU characterization sites. In 2017, ORNL-CCP proposed using a neutron-based DTC technique, which the EPA observed in operation during the 2016 continued compliance inspection and subsequently evaluated and approved as a T1 change in July 2017 (EPA Docket No. A-98-49; II-A4-209; EPA Air E-Docket No. EPA-HQ-OAR-2001-0012-0471).

Practically speaking, ORNL-CCP always uses the gamma technique when performing DTC but does not always use neutron-based DTC because it only applies to waste streams with easily measurable quantities of neutron-emitting radionuclides, i.e., californium-252, ^{238}Pu or curium-242-244. During this inspection, the EPA observed ORNL-CCP personnel perform both gamma and neutron-based DTC. Since the 2016 EPA inspection, ORNL-CCP has assayed 166 containers using DTC, and these results were compiled in 35 DTC batch data reports.

The criterion for a waste container's status as RH is expressed in terms of its dose rate in rem and includes the combination of its gamma and neutron contributions, as appropriate. This unit is technically incorrect, although it is commonly used throughout the DOE TRU generator sites to reflect the language in the Land Withdrawal Act. Technically, rem or millirem (mrem) is a unit of dose equivalent or, when it is expressed per unit of time, a dose equivalent rate [i.e., rem per hour or millirem per hour (mrem/hr)]. Field gamma measurements, including ORNL-CCP's gamma DTC measurements, are in units of roentgen (R) or milliroentgen (mR), or R per hour or mR per hour (mR/hr), which represent the external exposure or external exposure rate, respectively. The difference between the external exposure rate in mR/hr and the dose equivalent rate in mrem/hr for gamma radiation is negligible for this application. The dose equivalent rate for a container should include the gamma external exposure rate plus the neutron component, which is always measured in rem or millirem. ORNL-CCP reflects the language of the Land Withdrawal Act in characterization documentation and uses the terms "dose" and "dose rate" in place of the technically correct terms "dose equivalent" and "dose equivalent rate." ORNL-CCP also uses the terms R and rem interchangeably, as well as the terms mR/hr and mrem/hr. The EPA, therefore, also uses these terms and units interchangeably in this report.

Technical Evaluation: Dose-to-Curie

The EPA evaluated ORNL-CCP's continued compliance with the EPA-approved DTC procedures for RH waste characterization. The checklist used for this inspection is included in Attachment F.

(1) The EPA observed the dose-to-curie technique and found it to be adequately implemented.

The EPA observed the ORNL-CCP DTC operations in the DTC Alcove of Building No. 7880, Process Building of the TWPC at ORNL on March 6, 2018. The EPA observed DTC personnel begin operations by performing the operational check on Scale No. WIPP-193, which had a calibration that was valid until April 24, 2018. The ORNL-CCP DTC Operator, Ron Whitson, performed this check with a weight of 158.6 ± 1 kilograms using CCP Operator Aid OA-ORNL-0160-18. The Operator recorded the weight on the measurement control report (CCP-TP-504, Revision 20, Attachment 1) and summarized this activity in the DTC operational logbook, *Operational Logbook for Remote Handled Operations, Control No. CCP-RH-ORNL-DTC-02, 2-*

1-2018, ORNL Building 7800, Process Building. CCP Operator Aid OA-ORNL-0160-18 listed tolerances for the test drum weights, scale error, operational ranges for the gamma and neutron probes and acceptance criteria for source checks.

ORNL-CCP DTC Operators took background gamma and neutron dose readings while all containers were in a shielded position, followed by source checks for the high and low gamma, and neutron ranges and all measurements were recorded on the measurement control report (CCP-TP-504, Revision 20, Attachment 1) and summarized in the operational logbook (page 5). The EPA observed an overhead crane lift 55-gallon Drum No. ORRH-00963 onto the DTC assembly, where DTC personnel weighed the container and recorded the gross weight. Four gamma and neutron measurements were made as the container was rotated through four positions (0º, 90º, 180º and 270º), noted as R1 through R4. The DTC Operator recorded all measurements on the container data sheet (CCP-TP-504, Revision 20, Attachment 2), a copy of which was provided to the EPA. The measurements of the drum indicated an average 1-meter gamma dose rate of 16.25 mR/hr and an average 1-meter neutron dose rate of 78.8 mrem/hr.

ORNL site personnel controlled all drum operations remotely using a series of cameras and manipulators. ORNL-CCP DTC personnel observed the operations and directed ORNL personnel as necessary to perform gamma and neutron dose rate measurements. ORNL-CCP DTC personnel were working to the current revision of the ORNL-CCP DTC procedure (CCP-TP-504, Revision 20). A Thermo Model ESM FH 40G Ratemeter with a Model FHZ 512 probe measured the gamma dose rate for RH Container No. ORRH-00963 in the DTC Alcove, and a Ludlum Model 2363 with Model 42-41L measured the neutron component of the container's dose rate. Both instruments were located within the hot cell. The ORNL-CCP DTC Operator recorded the dose rate and other information in the DTC operational logbook.

The EPA did not identify any concerns regarding the technical adequacy and documentation of the gamma and neutron DTC operations at ORNL-CCP.

(2) The EPA assessed the dose-to-curie batch data reports and found them to be adequate.

ORNL-CCP provided the EPA reviewers with DTC Batch Data Report Nos. ORRHDTC17011, ORRHDTC17014, ORRHDTC17016 and ORRHDTC18001. These DTC batch data reports contained all applicable elements, including documentation of the containers' status as RH TRU waste, i.e., having contact dose rates greater than 200 mR/hr.

The EPA did not identify any concerns regarding the ORNL-CCP DTC batch data reports.

(3) The EPA assessed the training for dose-to-curie personnel and found it to be adequate.

ORNL-CCP provided the list of qualified individuals dated July 25, 2016, documenting that all personnel working as DTC Operators were appropriately trained. Two Operators/Independent Technical Reviewers, Spencer Pattee and Todd Shepley, are listed on the list of qualified individuals as not current on "Host Site training." Discussions with Ron Whitson indicated that these individuals only perform independent technical review, which does not require host site training. This was confirmed in the logbook for DTC.

The EPA did not identify any concerns regarding training for ORNL-CCP DTC personnel.

6.3.1 Radiological Characterization Findings and Approval

Summary of Dose-to-Curie Findings and Concerns

The EPA did not identify any findings or concerns for DTC at ORNL-CCP.

Dose-to-Curie Approval

There are no changes to the T1 or T2 designations for DTC as a result of this continued compliance inspection. Based on the results of this evaluation and the data examined, the EPA determines that ORNL-CCP demonstrated continued compliance with the EPA-approved waste characterization program for gamma- and neutron-based DTC techniques.

6.4 Real-Time Radiography (RTR) for Contact-Handled Waste Characterization

During this inspection, the EPA focused on the overall technical adequacy and implementation of RTR, including identification of waste material parameters and prohibited items. ORNL-CCP has one RTR unit (RTR-6) located in RTR Trailer, Building No. 7880-J at the TWPC, to examine 55-gallon drums of CH TRU wastes. Consequently, any standard waste boxes or other larger containers (casks) of CH waste must be repackaged prior to RTR examination. The checklist used for this inspection is included in Attachment G.

6.4.1 Technical Evaluation: Real-Time Radiography

(1) The EPA observed the real-time radiography examination process and found it to be adequate.

The EPA observed the RTR process conducted on RTR-6 at TWPC for container No. NFSS7932825, a 55-gallon container of SCG S4000 soil from Waste Stream OR-NFS-CH-SOIL. The RTR Operator was Eric Lyles, and he had successfully completed the image quality check prior to the EPA's arrival. The RTR demonstration commenced at the start of the examination of the drum, using procedure CCP-TP-053, Revision 16, to guide the examination.

The RTR Operator examined the container's contents and did the following:

- Evaluated the presence of any prohibited items in the container.
- Evaluated the need for initiating an NCR.
- Verified the waste matrix code.
- Determined that the waste matched the waste stream description.
- Determined the net weight of the container's waste by assigning estimated weights based on the RTR examination.
- Indicated the presence and type of a rigid liner, the number of layers of confinement and the presence of a lead liner.
- Determined the volume utilization percentage.

- Entered characterization data into the electronic data sheet, Attachment 2 from CCP-TP-053, Revision 16, and made Audio-visual Recording No. OR-RT-60874.

The EPA did not identify any concerns regarding the ORNL-CCP process for generating RTR data for CH TRU waste.

(2) The EPA examined real-time radiography characterization records and found them to be adequate.

The RTR Logbook No. OLB-CCP-CH-ORNL-RTR-UNIT 6-02-2018 documented that the Operator had confirmed the current list of qualified individuals, correct revision of CCP procedures and the waste-specific AK prior to beginning the RTR event.

The EPA reviewed written records for selected containers from CH Batch Data Report Nos. OR-RTR6-0771 and OR-RTR6-07717, containing 55-gallon drums of SCG S5400 wastes. For each batch data report, the ORNL-CCP RTR Operator had performed an image quality check and the required quality control examinations prior to each RTR event. ORNL-CCP RTR Operators had properly examined and identified each container's contents, verified the absence of prohibited items, determined that the waste matched the waste stream description and verified the waste matrix code. All characterization data were entered using electronic data sheets.

ORNL-CCP had generated 38 RTR NCRs since the 2016 inspection; however, there were no NCRs associated with the batch data reports that the EPA selected. The EPA did review NCR No. NCR-ORNL-0078-17, which was initiated during RTR due to the presence of impenetrable objects and subsequently was examined by CH VE, as discussed in section 6.5.1, Item (1), below. This NCR had been initiated, processed and closed appropriately. The EPA also reviewed three other RTR NCRs, Nos. NCR-ORNL-0226170 (February 15, 2017), NCR-ORNL-0232170 (June 1, 2017) and NCR-ORNL-0233170 (June 15, 2017), all of which were initiated, processed and closed appropriately.

The EPA did not identify any concerns regarding ORNL-CCP RTR characterization records for CH TRU waste.

(3) The EPA examined real-time radiography training records and found them to be adequate.

The EPA inspectors reviewed training records for ORNL-CCP RTR Operators Eric Lyles, Fred Oney, Dale Simpson, Aaron Elliot and Tony Johnson. The records included qualification cards, test and training container examination records and the records of the capability demonstration. The latest capability demonstration containers for RTR Operators/Independent Technical Reviewers indicated that they successfully identified all prohibited items in the training drums. The records included:

- Radiography data sheets for capability demonstration for RTR Operators/Independent Technical Reviewers
- Inventory for training Container Nos. NDE-TEST-59, NDE-TEST-60, NDE-TEST-68, NDE-TEST-69, NDE-TEST-70 and NDE-TEST-74

- Training Roster for Briefing for CCP-AK-ORNL-002 and CCP-AK-ORNL-500
- NDT Level-II Limited Certificates
- Annual eye examinations
- List of Qualified Individuals (LOQI) for dates in calendar years 2017 and 2018
- CCP-QP-002, Training and Qualification Plan, Revision 44
- CCP-TP-053, CCP Standard Real-Time Radiography Inspection Procedure, Revision 16
- CCP-TP-028, CCP Radiographic Training Container Construction, Revision 10

The last three bulleted items were performed in response to recent changes to the DOE Waste Acceptance Criteria that required additional training for all RTR Operators and Independent Technical Reviewers. The EPA determined that RTR training records were readily available for review and that ORNL-CCP RTR Operators and Independent Technical Reviewers are appropriately trained for performing RTR of CH TRU waste drums.

The EPA did not identify any concerns regarding training for ORNL-CCP RTR personnel.

6.4.2 Real-Time Radiography Findings and Approval

Summary of Real-Time Radiography Findings and Concerns

The EPA did not identify any findings or concerns related to RTR for CH wastes as a result of this continued compliance inspection.

Real-Time Radiography Approval

There are no changes to the T1 or T2 designations for RTR as a result of this continued compliance inspection. Based on the results of this evaluation and the data examined, the EPA determines that ORNL-CCP demonstrated continued compliance with the EPA-approved waste characterization program for RTR for TRU wastes.

6.5 Visual Examination (VE) for Characterizing Contact-Handled and Remote-Handled Waste

CCP-ORNL VE personnel perform both CH and RH VE in essentially the same manner in Building No. 7880, Process Building of the TWPC at ORNL. Specifically, ORNL site personnel handle the waste within a glove box line for CH TRU waste or using manipulators within a hot cell for RH TRU waste. ORNL site personnel unpack the drum or cask, removing and inspecting all contents in concert with ORNL-CCP VE personnel, who observe their actions and record the applicable attributes of the waste as it is repackaged in accordance with the CH and RH VE procedures, CCP-TP-113, Revision 21, and CCP-TP-500, Revision 16, respectively. Both CH and RH VE are discussed below.

6.5.1 Technical Evaluation: Visual Examination for Contact-Handled Waste

ORNL-CCP personnel stated that they had performed one VE event for CH drums this calendar year. The container used for ORNL-CCP's VE demonstration had previously undergone RTR but had failed RTR due to the presence of impenetrable materials, specifically, heavy metals, as discussed below. During this inspection, the EPA focused on the overall technical adequacy and implementation of the VE process for CH TRU wastes, including identification of waste material parameters and prohibited items. The checklist used for this inspection is included in Attachment H.

(1) The EPA observed visual examination of a contact-handled drum and found it to be adequate.

During the onsite inspection, ORNL-CCP demonstrated the CH VE process using SCG S5400 Container No. X10C9312233A (input) from Waste Stream OR-ISTP-CH-HET, which was repackaged into Container No. X10C9312233A1 (output). This container had previously failed RTR (Batch Data Report No. OR-RTR6-0789) due to the presence of impenetrable objects, as documented in NCR No. NCR-ORNL-0078-17. The ORNL CH Site Project Manager authorized VE for this container, which will be the only container documented in ORNL CH VE Batch Data Report No. ORVECH0190.

The VE event took place in the glovebox enclosure in TWPC Building No. 7880. Consistent with the EPA's approval, ORNL site personnel unloaded the input container's contents and removed each item for ORNL-CCP VE Operators to observe and record. Manipulating this container was challenging and required four ORNL VE personnel to handle the drum and its contents within the glove box enclosure. ORNL personnel Bill Young, Spencer Meyers, Steve Cunningham and Tracy Modenovsky manipulated the waste materials as ORNL-CCP VE Operators Chuck Wallace and Gilbert Gutierrez recorded the waste materials. The large pieces of metal that RTR had identified as impenetrable were clearly visible. As the ORNL site personnel repacked the inspected contents into a new drum, ORNL-CCP VE personnel verified the waste stream description and waste matrix code, confirmed the presence/absence of prohibited items and recorded all required data in accordance with CCP-TP-113, Revision 21.

The EPA did not identify any concerns regarding the ORNL-CCP process for the generating CH VE data.

(2) The EPA examined contact-handled visual examination characterization records and found them to be adequate.

The EPA reviewed CH VE Batch Data Report Nos. ORVECH0177 (containing three drums), ORVECH01780 and ORVECH0182 (containing one CH drum each). The Independent Technical Reviewer (Attachment 3) and Site Project Manager (Attachment 1) reviews had been completed and signed appropriately for all three batch data reports. ORNL VE Operators recorded the waste material parameter of each waste item, verified the waste matrix code and confirmed the absence of prohibited items, and two VE Operators and a Visual Examination Expert signed the data sheets. The EPA determined that ORNL-CCP properly processed the characterization records.

ORNL-CCP had not generated any VE-related NCRs for the EPA to review. However, the EPA reviewed NCR No. NCR-ORNL-0078-17, related to RTR, as discussed above, as well as NCR No. NCR-ORNL-0319-16, which was initiated due to the waste's physical form not matching the waste matrix code or waste description. Both NCRs had been initiated, processed and closed appropriately. ORNL-CCP CH VE Operators Chuck Wallace and Gilbert Gutierrez could describe how to initiate a corrective action.

The were no concerns regarding ORNL-CCP CH VE characterization records.

(3) The EPA examined contact-handled visual examination training records and found them to be adequate.

The EPA reviewed training records for all four ORNL-CCP VE Operators and Visual Examination Experts. The qualification cards and other training records were complete and available for review. Review of the latest list of qualified individuals for a variety of relevant dates demonstrated that the Operators performing the onsite demonstration were properly qualified. Both Visual Examination Experts had appointment letters.

The EPA did not identify any concerns regarding ORNL-CCP CH VE training records.

6.5.2 Technical Evaluation: Visual Examination for Remote-Handled Waste

During this inspection, the EPA focused on the overall technical adequacy and implementation of the VE process for RH TRU wastes, including identification of waste material parameters and prohibited items. At ORNL-CCP, RH VE and CH VE are performed by the same Operators, and, in general, there have been more RH VE events than CH VE at ORNL since the EPA's last inspection. The checklist used for this inspection is included in Attachment I.

(1) The EPA observed the visual examination of a remote-handled drum and found it to be adequate.

The EPA observed the VE process on material originating in Cask No. X10C9312233A from Waste Stream OR-ISTP-CH-HET, the report for which will be included in ORNL RH VE Batch Data Report No. ORRH00801. The ORNL (host site) VE Operators were Caleb Dryman and Logan Dean, and the ORNL-CCP VE Operators were Anthony Harley and Gilbert Gutierrez. The VE event took place in a hot cell enclosure in Building No. 7880, Process Building of the TWPC at ORNL. Consistent with the EPA's approval, ORNL site personnel performed the hands-on VE while ORNL-CCP Operators performed VE by confirming the waste stream description, verifying the waste matrix code and confirming the presence/absence of prohibited items. ORNL-CCP VE Operators recorded all pertinent information on the appropriate forms from CCP-TP-500, Revision 16.

The EPA did not identify any concerns regarding the ORNL-CCP process for generating RH VE data.

(2) The EPA examined remote-handled visual examination characterization records and found them to be adequate.

The EPA reviewed RH VE Batch Data Report Nos. ORNLRHVE167038, ORNLRHVE17053 and ORNLRHVE17064, all of which contained Independent Technical Reviewer reviews on CCP-TP-500, Attachment 2, and Site Project Manager reviews on CCP-TP-500, Attachment 3. The Independent Technical Reviewer and Site Project Manager reviews had been completed and signed appropriately. The EPA determined that ORNL-CCP properly processed the characterization records and verified that VE Operators recorded the waste material parameter of each waste item, verified the waste matrix code and confirmed the absence of prohibited items. At the time of inspection, ORNL-CCP had not generated any RH VE-related NCRs for the EPA to review. ORNL-CCP RH VE Operators described how they would initiate a corrective action. It is worth noting that all the currently active ORNL-CCP VE personnel perform both RH and CH VE and follow the same NCR process.

The EPA did not identify any concerns regarding ORNL-CCP RH VE characterization records.

(3) The EPA examined remote-handled visual examination training records and found them to be adequate.

The EPA reviewed training records for ORNL-CCP VE Operators and Visual Examination Experts. The qualification cards and other training records for all ORNL-CCP RH VE personnel were complete and available for review. Review of the list of qualified individuals for a variety of relevant dates demonstrated that the Operators performing VE and all other VE personnel were properly qualified.

The EPA did not identify any concerns regarding ORNL-CCP RH VE training records.

6.5.3 Visual Examination Findings and Approval

Summary of Visual Examination Findings and Concerns

The EPA did not identify any findings or concerns related to VE for CH or RH wastes during this continued compliance inspection.

Visual Examination Approval

There are no changes to the T1 or T2 designations for VE from this continued compliance inspection. Based on the results of this evaluation and the data examined, the EPA determines that ORNL-CCP demonstrated continued compliance with the EPA-approved waste characterization program for VE for CH and RH TRU wastes.

7.0 FINDINGS AND CONCERNS

The EPA did not identify any findings or concerns in this continued compliance inspection.

8.0 CONCLUSIONS

Changes to Tiering

Based on this inspection, there is one change to the CH AK T1 designations. On July 14, 2017, the EPA published a Federal Register notice (82 FR 32542) announcing the EPA's intent to eliminate the distinction between retrievably-stored and newly-generated TRU waste destined for disposal at the WIPP. The EPA did not receive any comments on this change; therefore, the EPA is removing the newly-generated T1 requirement from the ORNL-CCP CH AK T1 designations (see Table 1).

The EPA also changed the CH and RH AK T2 designations to (1) include BoK memoranda in the examples of enhanced AK documentation and (2) modify the enhanced AK T2 requirement for consistency with other EPA approvals, as shown in bold text in Tables 1 and 2.

The EPA also added additional explanatory footnotes to both Table 1 and Table 2 to clarify some of the T2 change designations. Other T1 and T2 changes that were initiated during the CH and RH baselines and subsequent T1 approvals remain in effect. The language in Tables 1 and 2 regarding AK documentation applies to all ORNL-CCP waste streams. The EPA will continue to make clarifying and editorial changes to the tiering tables as necessary.

Approval

The EPA determined that the ORNL-CCP waste characterization program activities continue to be technically adequate. The scope of the compliance decision is based on the EPA's inspection completed March 6–8, 2018.

ATTACHMENT A: APPROVAL SUMMARIES FOR ORNL-CCP WASTE CHARACTERIZATION PROGRAMS

Table A-1. Approval Summary for ORNL-CCP Contact-Handled Waste Characterization Program

Approved Activity	EPA Inspection Number, Approval Dates	EPA Docket Number
ORNL-CCP CH Baseline Approval	EPA-ORNL-CCP-CH-11.07-8, August 21, 2008	A-98-49; II-A4-103; EPA-HQ-OAR-2008-0449-0004
T1 Change – Extension of the Calibration and Density Ranges for the SGS NDA System	October 8, 2008	A-98-49; II-A4-108
T1 Change – Extension of the Passive Mode Calibration Range for the DWAS/IPAN SGS	January 8, 2009	A-98-49; II-A4-109
T1 Change – Addition of SCG S4000	October 7, 2009	A-98-49; II-A4-117; EPA-HQ-OAR-2001-0012-0380
Unannounced Continued Compliance Inspection	November 23, 2009	A-98-49; II-A4-121; EPA-HQ-OAR-2001-0012-0378
T1 Change – Addition of the MCS IQ3 NDA System and Visual Examination	March 30, 2010	A-98-49; II-A4-125; EPA-HQ-OAR-2001-0012-0370
T1 Change – Addition of NFS Trench B Soils to Waste Stream OR-NFS-CH-SOIL	March 23, 2011	A-98-49; II-A4-144
Continued Compliance Inspection	June 18, 2014	A-98-49; II-A4-186; EPA-HQ-OAR-2001-0012-0280
T1 Change – Addition of MILCC2 NDA System	October 21, 2014	A-98-49; II-A4-192; EPA-HQ-OAR-2001-0012-0440
T1 Change – Addition of CH VE	November 10, 2014	A-98-49; II-A4-193; EPA-HQ-OAR-2001-0012-0443
Continued Compliance Inspection	June 14, 2017	A-98-49; II-A4-207; EPA-HQ-OAR-2001-0012-0470

Table A-2. Approval Summary for ORNL-CCP Remote-Handled Waste Characterization Program

Approved Activity	EPA Inspection Number, Approval Dates	EPA Docket Number; EPA Air E-Docket No.
ORNL-CCP RH Baseline Approval	EPA-ORNL-CCP-RH-06.08-8, February 3, 2009	A-98-49; II-A4-111; EPA-HQ-OAR-2008-0820-0004
T1 Change – Addition of SETF Waste to Waste Stream OR-REDC-RH-HET	November 16, 2009	A-98-49; II-A4-120; EPA-HQ-OAR-2001-0012-0377
Unannounced Continued Compliance Inspection	November 23, 2009	A-98-49; II-A4-121; EPA-HQ-OAR-2001-0012-0378
T1 Change – Addition of Pre-SETF Waste to Waste Stream OR-REDC-RH-HET	April 21, 2010	A-98-49; II-A4-124; EPA-HQ-OAR-2001-0012-0363
Continued Compliance Inspection	June 18, 2014	A-98-49; II-A4-186; EPA-HQ-OAR-2001-0012-0280
Continued Compliance Inspection	June 14, 2017	A-98-49; II-A4-207; EPA-HQ-OAR-2001-0012-0470
T1 Change – Addition of Four New Scaling Factor Sets and Expansion of Waste Stream Dates	July 6, 2017	A-98-49; II-A4-209; EPA-HQ-OAR-2001-0012-0471

ATTACHMENT B: INSPECTION PERSONNEL

Personnel	Affiliation	Area of Expertise/Function	Entrance Meeting	Interviewed	Exit Meeting
Ed Feltcorn	U.S. EPA Radiation Protection Division	EPA Lead Inspector	✓		✓
Rajani Joglekar	U.S. EPA Radiation Protection Division	EPA Inspector	✓		✓
Patrick Kelly	SC&A/EPA Contractor	EPA Inspector, NDA, DTC, NDE	✓		✓
Kira Darlow	SC&A/EPA Contractor	EPA Inspector, AK	✓		✓
Lee Ann Veal	U.S. EPA Radiation Protection Division	Observer	✓		✓
Anthony Harley	CCP	VEE/Subject Matter Expert/On-the-Job Trainer	✓	✓	✓
Bill Young	ORNL	ORNL VE Operator		✓	
Craig Simmons	CCP	RH Project Manager	✓	✓	✓
David Queen	DOE/OREM	Project Manager	✓		
Derek Matheny	CCP	VEE/VPM	✓		✓
Derek Ott	CCP	Rad Engineer	✓		✓
Don Coffey	TWPC/AKPKE	Waste Programs	✓		✓
Eric Lyles	CCP	NDE/Lead Operator	✓	✓	
Fred Oney	CCP	NDE/Lead Operator	✓	✓	
Gilbert Gutierrez	CCP	VE Operator		✓	✓
Gio Barton	TWPC	Environmental Project Manager/Site Management Representative	✓		✓
Jake Knox	CCP	SPM	✓	✓	✓
Jeff Harrison	CCP	AKE	✓	✓	

Jeremy Robinson	CCP	Lead FGA/SME	✓		✓
Joe Harvill	CCP	Technical Advisor/NDA Support	✓	✓	✓
John Neal	ORNL	ORNL VE Operator		✓	
Julia Shenk	DOE EM HQ	Observer	✓		✓
Kevin Haar	CCP	Characterization Scientist	✓		✓
Linda Beach	North Wind/TWPC	TWPC Program Manager	✓		✓
Luis Santana	CCP	CCP Engineer	✓		✓
Mike Ramirez	CCP	CCP Manager	✓	✓	✓
Pat Tilmon	CCP	Project Manager	✓	✓	✓
Ray Peters	North Wind	ESH&Q Manager	✓		
Robert Ceo	Mirion	NDA Expert Analyst		✓	✓
Ronald Whitson	CCP	NDA/DTC Lead	✓	✓	✓
Ryan Martin	CCP	RH SPM	✓	✓	✓
S. Cunningham	ORNL	ORNL VE Operator		✓	
Shelly Martinez	CCP	Cognizant Engineer NDE	✓	✓	✓
Spencer Meyers	ORNL	ORNL VE Operator		✓	
Susan Anderson	CCP	NDA		✓	
Tom Carver	DOE/CBFO	Waste Certification Manager	✓		✓

Tracy Madenovsky	ORNL	ORNL VE Operator		✓	

ATTACHMENT C: ACCEPTABLE KNOWLEDGE CONTINUED COMPLIANCE INSPECTION CHECKLIST

EPA Inspection No.: CCP-ORNL-CC-2018 **Inspection Date: March 6–8, 2018**

1) Personnel

Does the waste characterization program adequately define, describe, address or satisfy the following:	Yes, No, NA	Objective Evidence and Comments
1-1) Are all AKEs and SPMs performing work for ORNL-CCP trained and qualified?	Yes	AKE qualification cards: Jeff Harrison, 10-6-2016; John Kleckner, 10-25-2016; Sherrod Reavis, 10-27-2016; Ryan Riordan, 10-27-2016; Travis Smith, 10-25-2016 CH SPM qualification cards: Terri-Anne Groover, 12-4-2014; Christopher Hatch, 7-13-2017; Rich Kantrowitz, 2-19-2015; Jake Knox, 10-23-2013; David Moody, 7-9-2015; Mike Ramirez, 11-3-2016; Beverly Schrock, 6-23-2010; Craig Simmons, 12-8-2014; Carolina Soaterna, 5-31-2011; Joe Stepzinski, 3-2-2017; Charles Turner, 4-19-2007; Laura Turner, 9-10-2015; Daniel Wade, 10-23-2013; Ryan Martin, 1-2-2018 RH SPM qualification cards: Rich Kantrowitz, 10-29-2012; Jake Knox, 12-21-2017; David Moody, 8-28-2013; Beverly Schrock, 1-18-2017; Craig Simmons, 9-17-2009; Carolina Soaterna, 9-12-2016; Charles Turner, 8-15-2013; Ryan Martin, 12-9-2016 Acknowledgement of: CCP-QP-002, Revision 44; CCP-QP-005, Revision 25; CCP-TP-002, Revision 27; CCP-TP-005, Revision 29; CCP-TP-200, Revision 3 Interviews with AKEs and SPMs during inspection indicate personnel are qualified.
1-2) If ORNL-CCP added AKEs and SPMs to the EPA-approved waste characterization program after the last EPA baseline or continued compliance inspection, were the new personnel fully trained and qualified prior to beginning work for this program?	Yes	The AKE and SPM qualifications are applicable to all CCP operations. Kleckner (AKE), Groover and Ramirez (CH SPMs) and Simmons (CH and RH SPM) are newly active with ORNL-CCP but not newly qualified in their roles. Reavis and Riordan (AKEs), Hatch (CH SPM) and Martin (CH and RH SPM) are new to both ORNL-CCP and CCP as a whole. They were fully qualified prior to performing duties unsupervised. Knox and Schrock were involved with the ORNL-CCP program as CH SPMs during the previous EPA inspection. Both have since also become qualified RH SPMs. They were fully qualified prior to performing RH duties unsupervised.

2) Acceptable Knowledge Nonconformances and Discrepancies

Does the waste characterization program adequately define, describe, address or satisfy the following:	Yes, No, NA	Objective Evidence and Comments
2-1) Are AK-affecting nonconformances documented appropriately such that adequate resolution is attained prior to continued container characterization and/or shipment?	Yes	NCR-ORNL-0128-17, NCR-ORNL-0129-17 Both NCRs are for containers that, based on results of AKA, needed to be removed from Waste Stream OR-REDC-CH-HET pending additional analyses/repackaging.
2-2) When appropriate, is AK re-evaluation adequately completed and documented? This may be documented on a CCP-TP-005, Att. 10, Acceptable Knowledge Re-evaluation Checklist.	Yes	None since last inspection. AK reevaluation associated with DR051 was appropriately not necessary.
2-3) Are discrepancies between AK source documents and/or between AK and characterization data documented and resolved? This may be documented on a CCP-TP-005, Att. 11, Acceptable Knowledge Source Document Discrepancy Resolution.	Yes	DR051; CCP-AK-ORNL-002, Revision 5 Documentation is complete; clarification changes made in AKSR, though none were required by discrepancy resolution process.

3) Waste Stream Definition and Waste Identification

Does the waste characterization program adequately define, describe, address or satisfy the following:	Yes, No, NA	Objective Evidence and Comments
3-1) Is all waste within a waste stream generated from a single process/activity and does the AK adequately describe the single process/activity?	Yes	CCP-AK-ORNL-001, Revision 11; CCP-AK-ORNL-002, Revision 5; CCP-AK-ORNL-005, Revision 3; CCP-AK-ORNL-013, Revision 0; CCP-AK-ORNL-500, Revision 6 9735 and 3019-A overlap with LWBR fuel; 2026 replaced 3019-A; in general, 9735 performed mass spectrometry for other parts of Analytical Chemistry Division, so all campaigns could be in common (P517, P1214, U038) RH review documented in T1 evaluation report. (C174, M100, M297)
3-2) Is all waste within a waste stream similar in material and physical form and are the expected physical parameters adequately described? The expected physical parameters may be documented on a CCP-TP-005, Att. 6, Waste Form, Waste Material Parameters, Prohibited Items, and Packaging, and/or the associated memorandum.	Yes	CCP-AK-ORNL-001, Revision 11; CCP-AK-ORNL-002, Revision 5; CCP-AK-ORNL-005, Revision 3; CCP-AK-ORNL-013, Revision 0 OR-NFS-CH-SOIL: Att. 6, 7-6-2017, Memorandum 1-16-2014 OR-NFS-CH-HET-A: Att. 6, 7-6-2017, Memorandum 9-17-2009 OR-REDC-CH-HET: Att. 6, 3-27-2017, Memorandum 7-11-2008 OR-REDC-RH-HET: Att. 6, 10-3-2017, Memoranda 3-29-2016 and 7-11-2008 Att. 6s are being reviewed and resigned with each AKSR revision to ensure changes are captured as necessary. Memoranda are only reissued when changes necessary. RH review documented in T1 evaluation report.

Does the waste characterization program adequately define, describe, address or satisfy the following:	Yes, No, NA	Objective Evidence and Comments
3-3) Are the expected radiological characteristics for each waste stream adequately described in the AK and are the limitations of AK for use in radiological characterization or assay adequately communicated? For CH waste, the radiological characteristics and AK limitations may be documented on a CCP-TP-005, Att. 7, Radionuclides, and/or the associated AK-NDA memorandum.	Yes	CCP-AK-ORNL-001, Revision 11; CCP-AK-ORNL-002, Revision 5; CCP-AK-ORNL-005, Revision 3; CCP-AK-ORNL-013, Revision 0 OR-NFS-CH-SOIL: Att. 7, 7-6-2017, Memorandum 5-28-2014 OR-NFS-CH-HET-A: Att. 7, 7-6-2017, Memorandum 5-28-2014 OR-REDC-CH-HET: Att. 7, 9-7-2017, Memorandum 9-6-2017 C238 Att. 7s are being reviewed and resigned with each AKSR revision to ensure changes are captured as necessary. Memoranda are only reissued when changes necessary. RH review documented in T1 evaluation report.
3-4) For RH waste, does all waste within a waste stream have similar radiological properties?	Yes	RH review documented in T1 evaluation report.

Does the waste characterization program adequately define, describe, address or satisfy the following:	Yes, No, NA	Objective Evidence and Comments
3-5) Are waste containers traceable from retrieval or generation through ORNL-CCP's EPA-approved characterization process? Traceability records may include add-container memoranda (may include CCP-TP-005, Att. 8, Waste Containers List), drum-specific paperwork from the generator site, IWMDLs, characterization BDRs, WDS screenshots or demonstrations.	Yes	Container No. X10C9311877A, Waste Stream OR-CHEM-CH-HET: – Parent: X10C9311877 paperwork for waste stream acceptance (M157) – Repack paperwork for IWMDL applicability (M159) – Add-container memorandum, 1-9-2017 (M175) – IWMDL (Att. 9), 1-12-2016 (not provided) – Att. 8, 1-20-2016, 2-19-2018 Container Nos. X10C0402918H1 and X10C0402918BO1, Waste Stream OR-REDC-CH-HET: – Original cask: X10C0402918 paperwork for waste stream acceptance (M100); TWPC acceptability (M286) – X10C0402918H: generated repackaging parent cask (M073); found to be deteriorating (WNCR-2016-040, M287); container being repackaged when lithium ion battery from X10C0402918BO deemed acceptable, so battery added (M073); during repackaging added absorbent (OPIP-2017-048, M287; M073) – X10C0402918BO: generated during hot cell maintenance after packaging parent cask (M073); AKA evaluation identified questionable lithium battery (NCR-ORNL-0128-17) so repacked to remove battery (WNCR-2017-021, M287; M073) – Add-container memorandum, 10-23-2017 for both (M155) – IWMDL (Att. 9), 6-5-2017 – however, the IWMDL was revised in September 2017 (9-27-2017), prior to repackaging of these containers in October 2017. The applicable CH repackaging procedure (P254) was revised during this time; however, the procedure revision did not impact TRU waste management, and the AKE has not yet observed the changes for the previous revision. – Att. 8, 2-19-2018 Container No. X10C0402973DJ1, Waste Stream OR-CRF-CH-HET: – Original box: X10C0402973 paperwork for waste stream acceptance (M273) – Repacked into X10C0402973DJ on 2-12-2013 (M274); OPIP-20013-229 for impenetrable item (M032) – Repacked into X10C0402973DJ1 on 2-15-2017 (M274) – Add-container memorandum, 4-3-2017 (M033) – IWMDL (Att. 9), 10-31-2016 – Att. 8, 5-16-2016 Att. 3s for P254, P1444

4) Enhanced Acceptable Knowledge

Does the waste characterization program adequately define, describe, address or satisfy the following:	Yes, No, NA	Objective Evidence and Comments
4-1) Has review of the AK associated with certifiable payload containers generated since August 25, 2016, been conducted and documented to provide reasonable assurance that management and packaging of the containers is bounded by the applicable AKSRs? This may be documented on a CCP-TP-005, Att. 9, Interface Waste Management Documents List, on the CCP-TP-005, Att. 3, Acceptable Knowledge Source Document Summary for each document listed on the Att. 9 and/or in a new revision of the AKSR.	Yes	Att. 9, OR-REDC-CH-HET, 6-5-2017 and 9-27-2017 Att. 9, OR-CRF-CH-HET, 10-31-2016 Att. 9, OR-CHEM-CH-HET, 6-5-2017 and 12-20-2017 CH ORNL-CCP AK Tracking Spreadsheet, 2-28-2018 RH ORNL-CCP AK Tracking Spreadsheet, 2-7-2018 M033, M155, M175, P254, P432, P584, P585, P994, P1443 RH review documented in T1 evaluation report.
4-2) Has review of the AK associated with certifiable payload containers generated prior to August 25, 2016, been conducted and documented to provide reasonable assurance that management and packaging of the containers is bounded by the applicable AKSRs? This may be documented in an AKA; there may be more than one AKA per waste stream.	Yes	AKA001 (with Addendum 1), AKA002, AKA003 CH ORNL-CCP AK Tracking Spreadsheet, 2-28-2018 NCR-ORNL-0128-17, NCR-ORNL-0129-17 M155
4-3) Are the technical assumptions used to evaluate the chemical compatibilities within a waste stream clearly documented and reasonable and/or justified? Is the overall evaluation sufficient to identify any potential impacts to the long-term isolation of TRU waste?	Yes	CCE001, CCE008 C239, C182, P590, P591, P592, P988, P1402, P1439, P1489, U058 AKA002
4-4) Are the technical assumptions used to evaluate the subject containers against the specified criteria of the BoK for the treatment and management of oxidizing materials clearly documented and reasonable and/or justified?	Yes	BOK001 CCE001

5) Waste Stream Certification

Does the waste characterization program adequately define, describe, address or satisfy the following:	Yes, No, NA	Objective Evidence and Comments
5-1) For RH waste streams, are the certification plans complete and do they adequately describe the role of AK in the waste characterization methodology?	Yes	CCP-AK-ORNL-502, Revision 5 There is only one EPA-approved RH waste stream, and the certification plan has not changed and is not expected to change.
5-2) Is the CBFO-approved waste stream profile package – including the WSPF, a characterization information summary, and a summation of aspects – complete and accurate?	Yes	WSPF, OR-NFS-CH-SOIL, Revision 1, 7-27-2017 WSPF, OR-REDC-CH-HET, 4-20-2009 WSPF, OR-REDC-RH-HET, 2-18-2009

Does the waste characterization program adequately define, describe, address or satisfy the following:	Yes, No, NA	Objective Evidence and Comments
5-3) Has a characterization checklist been completed and signed by a qualified AKE and SPM for each characterization lot? This may be documented on CCP-TP-005, Att. 13, CCP Waste Stream Characterization Checklist.	Yes	Att. 13, OR-NFS-CH-SOIL, Lots 18–33 Att. 13, OR-NFS-CH-HET-A, Lot 25 Att. 13, OR-REDC-CH-HET, Lots 78–79 WIPP Form 17-689 ORNL-CCP is only generating characterization lots for shippable waste streams (i.e., that have complete enhanced AK). ORNL-CCP voided OR-NFS-CH-SOIL Lots 14–17 (reviewed in previous EPA continued compliance evaluation) because the lots were created prior to implementation of enhanced AK checks. After all enhanced AK approved for Waste Stream OR-NFS-CH-SOIL permission to certify the containers was reestablished, ORNL-CCP re-added those containers as appropriate to Lots 18–33. OR-NFS-CH-HET-A, Lot 25, OR-REDC-CH-HET, Lots 78–79, are not newly created since the previous EPA continued compliance evaluation, but they were not transmitted to records until just before the next CBFO recertification audit (March 2017). None of the containers from Lot 25 and none except one from Lots 78–79 were removed from the lots by WIPP Form 17-689 because certification was complete. The checks imposed in WDS will still prevent the containers from being shipped without enhanced AK.
5-4) Has a characterization information summary been adequately completed for each characterization lot?	Yes	Characterization Information Summary, OR-NFS-CH-SOIL, Lots 18–33 Characterization Information Summary, OR-NFS-CH-HET-A, Lot 25 Characterization Information Summary, OR-REDC-CH-HET, Lots 78–79
5-5) Has an AK accuracy report been completed for each active waste stream at least annually and is the report complete and technically adequate? This may be documented on a CCP-TP-005, Att. 14, CCP Acceptable Knowledge Accuracy Report, with an associated narrative.	Yes	AK Accuracy Report, OR-NFS-CH-SOIL, No New Lots, 3-31-2017; Lots 18–33, 2-28-2018 – 2018 accuracy report revises the count of containers from each previous year to remove the containers from Lots 14–17 (see AK checklist item 5-3) and avoid double counting. AK Accuracy Report, OR-NFS-CH-HET-A, Lot 25, 6-19-2017; No New Lots, 2-28-2018 AK Accuracy Report, OR-REDC-CH-HET, Lots 77–79, 3-31-2017; No New Lots, 2-28-2018 – removal of the one container from Lot 78 should happen in the next accuracy report that includes new lots. AK Accuracy Report, OR-CHEM-CH-HET, Lot 8, 6-19-2017 AK Accuracy Report, OR-REDC-RH-HET, Lots 1–35, 3-16-2017; No New Lots, 3-2-2018

6) Data Quality Objectives (RH Waste Streams Only)

Does the waste characterization program adequately define, describe, address or satisfy the following:	Yes, No, NA	Objective Evidence and Comments
6-1) Has ORNL-CCP identified and documented the methods by which all DQOs (i.e., DQO for defense waste, HLW and SNF determination; DQOs for radioactive properties: TRU waste determination, RH waste determination and activity determination; and DQOs for physical properties: liquids and physical form) and associated QAOs will be met?	Yes	CCP-AK-ORNL-502, Revision 5 There is only one EPA-approved RH waste stream, and the certification plan has not changed and is not expected to change.
6-2) If ORNL-CCP is using AK to quantify measurement parameters, including in direct support of scaling factor development, is the AK part of the AK Record, has the AK qualification pathway been identified, and has the qualification been satisfactorily completed? (AK used to determine ORIGEN inputs should be part of the AK record but does not need to be qualified.)	Yes	CCP-AK-ORNL-501, Revision 6 M100, M234, U090, U091, U092, U093, U659, U660, The AK being used in direct support of scaling factor development for the various populations within Waste Stream OR-REDC-RH-HET was qualified and evaluated by the EPA (see EPA e-Docket Nos. EPA-HQ-OAR-2008-0820-0004, EPA-HQ-OAR-2001-0012-0363 and EPA-HQ-OAR-2001-0012-0377).
6-3) Has ORNL-CCP adequately met the DQOs and QAOs that were to be addressed with AK?	Yes	See AK checklist items 7-7 and 7-8.
6-4) Has ORNL-CCP adequately documented that each characterization lot meets the DQOs and QAOs? This may be documented on the CRR.	NA	ORNL-CCP is not certifying any RH waste at this time and has not generated any RH lots since the last EPA continued compliance inspection.

7) System of Controls

Does the waste characterization program adequately define, describe, address or satisfy the following:	Yes, No, NA	Objective Evidence and Comments
7-1) Has ORNL-CCP requested a T1 change approval for any new RH waste streams or for modifications to the approved population of the OR-REDC-RH-HET wastes to include any containers not included in the CCP-AK-ORNL-501, Revision 3, analysis prior to certifying such waste?	Yes	T1 Request Letter dated 9-20-2017
7-2) Has ORNL-CCP requested a T1 change approval for any substantive modifications to the RH AKSR (e.g., CCP-AK-ORNL-500), certification test plan (e.g., CCP-AK-ORNL-502), CSSF, AK accuracy report and WSPF prior to certifying waste affected by such changes?	Yes	T1 Request Letter dated 9-20-2017
7-3) Did ORNL-CCP request a T1 change approval prior to performing any load management of waste?	Yes	ORNL-CCP does not load manage TRU waste.

Does the waste characterization program adequately define, describe, address or satisfy the following:	Yes, No, NA	Objective Evidence and Comments
7-4) Are AKSRs complete and do they contain sufficient detail to delineate each included waste stream?	Yes	CCP-AK-ORNL-001, Revision 11; CCP-AK-ORNL-002, Revision 5; CCP-AK-ORNL-005, Revision 3; CCP-AK-ORNL-013, Revision 0; CCP-AK-ORNL-500, Revision 6
7-5) Is the AK collection process adequately documented? Documentation may include CCP-TP-005 attachments: Att. 1, Acceptable Knowledge Documentation Checklist; Att. 2, Record of Communication; Att. 3, Acceptable Knowledge Source Document Summary; Att. 4, Acceptable Knowledge Information List.	Yes	OR-NFS-CH-SOIL: Att. 1, 7-6-2017; Att. 4, 7-10-2017 OR-NFS-CH-HET-A: Att. 1, 7-6-2017; Att. 4, 7-10-2017 OR-REDC-CH-HET: Att. 1, 3-30-2017; Att. 4, 4-4-2017 OR-CRF-CH-HET: Att. 4, 4-4-2017 and 3-6-2018 OR-REDC-RH-HET: Att. 1, 11-7-2017; Att. 4, 11-13-2017 Completed Att. 3 forms were reviewed for source documents listed in this checklist. One had to be resubmitted to records because the correct file was not available. The OR-CRF-CH-HET Att. 4 had to be revised to add the source document containing add-container memoranda (not yet listed in the AKSR). Records of communication are included in the sourced documents listed in this checklist, but the communications are primarily by email and therefore not recorded on an Att. 2 form. Completed Att. 1 forms are now being reviewed to ensure that only those source documents that are cited in the AKSR are listed in the Att. 1.
7-6) If applicable, are the data and information shared between related waste streams adequately documented? For RH waste, this may be documented on CCP-TP-005, Att. 15, CCP TRU Waste Correlation and Surrogate Summary Form.	Yes	Att. 15, OR-REDC-RH-HET, 11-26-2013
7-7) Is the DOE defense determination for all WIPP-bound waste documented?	Yes	CCP-AK-ORNL-001, Revision 11; CCP-AK-ORNL-002, Revision 5; CCP-AK-ORNL-005, Revision 3; CCP-AK-ORNL-013, Revision 0 RH review documented in T1 evaluation report.
7-8) Is the DOE determination that none of the waste in the waste stream is HLW or SNF documented?	Yes	CCP-AK-ORNL-001, Revision 11; CCP-AK-ORNL-002, Revision 5; CCP-AK-ORNL-005, Revision 3; CCP-AK-ORNL-013, Revision 0 RH review documented in T1 evaluation report.

8) T2 Reporting Requirements

Does the waste characterization program adequately define, describe, address or satisfy the following:	Yes, No, NA	Objective Evidence and Comments
8-1) Has ORNL-CCP reported to the EPA completion or substantive modification to CH CCP-TP-005, Att. 4s?	Yes	FY2017 3rd Quarter T2 report FY2017 4th Quarter T2 report Of the four CH Att. 4s listed in AK checklist item 7-5, none were reported in T2 reporting. This is acceptable because none of the revisions were substantive.
8-2) Has ORNL-CCP reported to the EPA completion or substantive modification to CH CCP-TP-005, Att. 6s, and/or the associated WMP memoranda?	Yes	FY2017 4th Quarter T2 report Of the three CH Att. 6s listed in AK checklist item 3-2, only the OR-NFS-CH-SOIL Att. 6 was reported in T2 reporting. This is acceptable because none of the other revisions were substantive.
8-3) Has ORNL-CCP reported to the EPA completion or substantive modification to CH CCP-TP-005, Att. 7s, and/or the AK-NDA memoranda?	Yes	FY2017 1st Quarter T2 report FY2017 4th Quarter T2 report Of the three Att. 7s listed in AK checklist item 3-3, only the OR-REDC-CH-HET Att. 7 included a substantive chance. This revision was reported in T2 reporting as expected.
8-4) Has ORNL-CCP reported to the EPA completion or substantive modification to CCP-TP-005, Att. 8s, and/or the associated add-container memoranda? RH requirement applies only to the memoranda.	Yes	FY2017 2nd Quarter T2 report FY2017 3rd Quarter T2 report FY2017 4th Quarter T2 report FY2018 1st Quarter T2 report
8-5) Has ORNL-CCP reported to the EPA completion or revision of AK accuracy reports? For CH AK accuracy reports, only completion or *substantive* modification requires EPA notification.	Yes	FY2017 2nd Quarter T2 report FY2017 3rd Quarter T2 report
8-6) Has ORNL-CCP reported to the EPA completion or substantive modification to DR reports (CH and RH) or data limitation information (RH only; refers to use of historical data)? For CH waste, the tiering table explicitly mentions AK-AK and AK-NDA/NDE DR reports.	Yes	FY2017 1st Quarter T2 report FY2017 3rd Quarter T2 report FY2017 4th Quarter T2 report
8-7) Has ORNL-CCP reported to the EPA completion or revision of WSPFs, including related attachments (e.g., CIS) for all new or modified waste streams, including change notices? For CH WSPFs, only completion or *substantive* modification requires EPA notification.	Yes	FY2017 4th Quarter T2 report

Does the waste characterization program adequately define, describe, address or satisfy the following:	Yes, No, NA	Objective Evidence and Comments
8-8) Has ORNL-CCP reported to the EPA completion or revision of AKSRs and certification test plans? For CH AKSRs, only completion or *substantive* modification requires EPA notification. Note especially whether substantive modifications to CCP-AK-ORNL-002 have been reported to the EPA.	Yes	FY2016 4th Quarter T2 report FY2017 3rd Quarter T2 report FY2017 4th Quarter T2 report
8-9) Has ORNL-CCP reported to the EPA completion or nonsubstantive modification of CSSFs?	NA	CSSF has not been modified since last EPA continued compliance.
8-10) Has ORNL-CCP reported to the EPA any new or substantive modification to site procedures requiring CBFO approval?	NA	There are no AK-related ORNL-CCP-specific procedures.
8-11) Has ORNL-CCP provided lists of active ORNL-CCP CH and RH AKEs and SPMs?	Yes	FY2016 4th Quarter T2 report FY2017 1st Quarter T2 report FY2017 2nd Quarter T2 report FY2017 3rd Quarter T2 report FY2017 4th Quarter T2 report

ATTACHMENT D: IQ3 SYSTEM CONTINUED COMPLIANCE INSPECTION CHECKLIST

EPA Inspection No.: CCP-ORNL-CC-2018 **Inspection Date: March 6–8, 2018**

1) General System Attributes

Technical Elements	Yes, No, NA	Comments and Objective Evidence
1-1) Is the IQ3 the same system previously approved by the EPA, and is it in the same location?	Yes	The IQ3 is a segmented gamma scanning system that acquires quantitative data with three detectors and isotopic data with an additional set of three detectors simultaneously. The IQ3 assay system was relocated to ORNL from SRS in 2009, following which the EPA approved it for WIPP assays. From May 2011 to September 2013, the IQ3 was performing non-WIPP assays. WASTREN recalibrated the IQ3 in 2012 following the replacement of detectors and electronic upgrades, and ORNL-CCP has accepted the 2012 calibration that the EPA determined was technically adequate for WIPP assays. This configuration had not changed since the 2016 EPA inspection.
1-2) Is the IQ3 unchanged, i.e., there are no significant departures from what the EPA had approved previously?	Yes	Only minor changes have been made to the IQ3 and documented in the calibration verifications discussed in IQ3 checklist item 3-7, below. These changes are minor and are consistent with routine system performance and maintenance.

2) System Performance

Technical Elements	Yes, No, NA	Comments and Objective Evidence
2-1) Are the containers, types of TRU waste, and the operational parameters within the ranges that the EPA has approved for the IQ3?	Yes	The physical configuration of the IQ3 limits it to assaying 55-gallon drums; i.e., no other containers will fit in the system as currently configured. Assaying any other size waste container would be considered a T1 change and would require subsequent EPA approval prior to use.
2-2) How many waste containers (and number of BDRs) were assayed by the IQ3 since the time of the last approval?	NA	Since the 2016 EPA continued compliance inspection, the ORNL-CCP IQ3 has assayed approximately 377 drums, which were compiled into 96 BDRs. ORNL-CCP NDA personnel indicated that some of these assays were not WIPP eligible; i.e., >100 nCi/g TAAC.
2-3) Is the IQ3 able to report quantitative values and uncertainties for the WIPP-tracked radionuclides?	Yes	During the evaluation, ORNL-CCP NDA personnel confirmed the following: • Directly measured radionuclides: ^{238}Pu, ^{239}Pu, ^{241}Am, ^{233}U, ^{235}U, ^{238}U, ^{137}Cs and ^{237}Np • Radionuclides scaled to directly measured radionuclides: ^{90}Sr, ^{234}U and ^{242}Pu • Isotopic ratios are determined by MGA or FRAM, or approved AK isotopic profiles MCS-IQ3-CALIB-2012, Revision 1

Technical Elements	Yes, No, NA	Comments and Objective Evidence
2-4) Have background measurements been taken each operational day? Have any instances of problematic background radiation been documented?	Yes	ORNL-CCP personnel took IQ3 background measurements daily, as confirmed by entries in IQ3 NDA Operational Logbook CCP-CH-ORNL-NDA-IQ3-02 and the IQ3 BDRs discussed in IQ3 checklist item 3-10 below. While background at the site is not necessarily a problem, the staging/movement of high-dose-rate waste containers near the IQ3 trailer may affect background temporarily. ORNL-CCP NDA personnel are experienced in addressing these situations adequately.
2-5) Have system performance checks been completed at least once per operational day? Are the procedures for the performance checks technically adequate for the IQ3?	Yes	Performance checks for the IQ3 were done daily, as confirmed by entries in IQ3 NDA Operational Logbook CCP-CH-ORNL-NDA-IQ3-02 and IQ3 BDRs discussed in IQ3 checklist item 3-10 below.

3) System Calibration & Calibration Verifications

Technical Elements	Yes, No, NA	Comments and Objective Evidence
3-1) Does the IQ3 have a calibration of record? Were consensus standards used in the initial calibration? If so, which standards?	Yes	The EPA confirmed that the IQ3 calibration of record is appropriately documented in MCS-IQ3-CALIB-2012, Revision 1, and that is the same as was observed in the 2016 EPA inspections and is technically adequate. The IQ3 calibration is efficiency based, as described in the ASTM C-1133 standard.
3-2) Are the calibration, execution of performance checks and operation of the IQ3, the calculation of radionuclide values and the review/validation of IQ3 data governed by controlled-copy (formal) procedures?	Yes	All pertinent IQ3 functions are governed by formal CCP procedures, as follows: • CCP-TP-047, Revision 13 (operating procedure) • CCP-TP-046, Revision 6 (calibration procedure) • CCP-TP-048, Revision 17 (data validation procedure)
3-3) Are the current revisions of procedures in use for the IQ3?	Yes	The EPA observed that the current revisions of CCP-TP-046 and CCP-TP-047 were available in the IQ3 control room for the Operators' use. IQ3 Operators verify the current revision of the procedures daily, as documented in the IQ3 operating logbook.
3-4) Are the isotopic contributions of unmeasured radionuclides derived using a certain method?	Yes	During the inspection, ORNL-CCP personnel confirmed that the isotopic distributions of ^{241}Am and Pu radionuclides are determined by MGA using data acquired on the LEGe detectors, when sufficient radionuclide masses are present. ORNL-CCP also uses approved isotopic distributions, as required by the EA. The EPA determined this was unchanged since the EPA's last inspection and was technically adequate.
3-5) Were traceable radionuclide sources used for calibration confirmation and/or verifications? If so, list or reference all standards used.	Yes	Source certificates are summarized in MCS-IQ3-CAL-CONF-RPT-2013-01. All sources are traceable to the national standards base and are appropriate for calibration confirmation and verification for the IQ3.

Technical Elements	Yes, No, NA	Comments and Objective Evidence
3-6) Have the operational ranges with respect to matrix (density) and activity been determined for the IQ3?	Yes	Acceptable density range is approximately 0.015–1.64 g/cc for multi-curve assays without attenuators. Because the IQ3 has an efficiency-based calibration, the operating range is a function of dead-time and gamma-ray attenuation, and the range is formally expressed as the system's LLD at the low end to whatever activity will provide acceptable spectral parameters (peak shape and resolution) and system dead time at the high end. Use of the attenuated mode is expressly prohibited. ORNL-CCP also arbitrarily states the upper end of the range is 175 g ^{239}Pu.
3-7) Has a calibration verification been completed for the IQ3? If so, what is the date of the last calibration verification? Have any others been completed in the last year?	Yes	Five calibration verifications were performed since the 2016 EPA inspection, documented in MCS-IQ3-CALVER-2016-03, MCS-IQ3-CALVER-2017-01, MCS-IQ3-CALVER-2017-02, MCS-IQ3-CALVER-2017-03 and MIRION-IQ3-CALVER-2018-01. The EPA reviewed the reports for all calibration verifications, as discussed below. MCS-IQ3-CALVER-2016-03, MCS-IQ3-CALVER-2017-01 and MCS-IQ3-CALVER-2017-03 were requited following replacement of LEGe and/or planar detectors. The calibration verifications performed following each detector replacement confirmed that the IQ3's performance was acceptable. MCS-IQ3-CALVER-2017-02 was performed upon bringing the IQ3 back into service following an approximate three-month out-of-service period. MIRION-IQ3-CALVER-2018-01was performed following repairs to the IQ3's drum positioning sensors and door. The calibration verification confirmed that the IQ3's performance was acceptable. The calibration verification occurred in February 2018, at which time Mirion Industries had taken over the IQ3's operation, which explains the different title, as discussed in section 6.2.1 Item (3) of this report.
3-8) Does the IQ3 meet the requirements for accuracy and precision as specified in DOE/WIPP-02-3122, Appendix A, Table A-3.2, for calibration verifications?	Yes	The calibration verification results documented in MCS-IQ3-CALVER-2016-03, MCS-IQ3-CALVER-2017-01, MCS-IQ3-CALVER-2017-02, MCS-IQ3-CALVER-2017-03 and MIRION-IQ3-CALVER-2018-01 all show %R values between 90 and 110% and %RSD values of less than 6.6% for three replicates, as required.
3-9) Have any NCRs related to the IQ3 been issued since the last EPA continued compliance Inspection?	NA	There have not been any system-wide NCRs for the IQ3 since the 2016 EPA inspection.
3-10) Do the IQ3 BDRs contain the following: • Testing facility name, testing batch number, container numbers, and signature of the SPM or designee • Table of contents • Background and performance check data or control charts for the relevant time period • Separate testing report sheets for each container	Yes	The EPA requested three IQ3 BDRs randomly selected from a list of all BDRs since the last inspection, listed below. All BDRs reviewed were found to contain the required information. OR-IQ3-0702, OR-IQ3-0706, OR-IQ3-0771

Technical Elements	Yes, No, NA	Comments and Objective Evidence
3-11) 3.11 Do the RDSs include: • Title "Radioassay Data Sheet" • Method/procedure used • Date of radioassay • Activities and associated TMU for individual radionuclides • TRU alpha concentration and its associated TMU • Operator and reviewer signatures	Yes	RDSs from the three IQ3 BDRs were found to contain required information. OR-IQ3-0702, OR-IQ3-0706, OR-IQ3-0771

4) Total Measurement Uncertainty

Technical Elements	Yes, No, NA	Comments and Objective Evidence
4-1) Is the TMU method unchanged since the previous inspection?	Yes	The TMU for the IQ3 is documented in MCS-IQ3-TMU-2009, Revision 0, July 8, 2009. Components of the uncertainty include counting statistics, calibration source strength and curve fitting, isotopic determinations, self-absorption effects, matrix non-homogeneity, source distribution, end effects and attenuator caps, all of which are considered to be independent and are added in quadrature. The EPA confirmed that the TMU determination and documentation were unchanged since the 2016 EPA inspection and that they were technically adequate.
4-2) Is the magnitude of the TMU values observed in the IQ3 BDRs examined during the inspection within the expected range?	Yes	This was conformed in reviewing the IQ3 BDRs. OR-IQ3-0702, OR-IQ3-0706, OR-IQ3-0771

5) Lower Limit of Detection

Technical Elements	Yes, No, NA	Comments and Objective Evidence
5-1) Has the LLD for the IQ3 has been determined? Is the LLD determination appropriate for the types of TRU waste ORNL-CCP expects to assay on the IQ3? Is the technical basis for the LLD determination documented?	Yes	ORNL-CCP determined LLD values by performing replicate assays of a zero matrix, mixed metals and sludge matrices in containers without radioactive sources. The LLD varies as a function of background, measurement time and matrix. ORNL-CCP provided example LLDs for all three matrices, as documented in MCS-IQ3-CAL-CONF-RPT-2013-01, Revision 1 The LLD values are appropriate for the TRU wastes that ORNL-CCP has been assaying.
5-2) Is the IQ3 used to discriminate TRU/non-TRU wastes at the 100 nCi/g criterion? If so, does the IQ3 have the required sensitivity?	Yes	The IQ3 can discriminate between non-TRU and TRU waste at the 100 nCi/g criterion based on the example LLDs reported in MCS-IQ3-CAL-CONF-RPT-2013-01, Revision 1, for measured ^{238}Pu, ^{239}Pu, ^{240}Pu and ^{241}Am. Lower activity sludge drums may present measurement challenges, as ORNL-CCP noted.

Technical Elements	Yes, No, NA	Comments and Objective Evidence
5-3) Are there any instances where an LLD value for a non-measured radionuclide is not provided based on a lack of technical feasibility?	Yes	Reporting thresholds are not discussed in the Calibration Report but are reported in ORNL-CCP NDA memoranda. Because the LLD is a measurement-based parameter, ORNL-CCP personnel stated that it is not technically feasible to calculate an LLD equivalent for radionuclides that are not directly measured, i.e., ^{242}Pu, ^{234}U and ^{90}Sr. ^{238}Pu, ^{240}Pu and ^{242}Pu are not always quantified directly based on their gamma emission but are derived by applying a ratio to the measured ^{239}Pu. The reporting threshold for ^{90}Sr is computed based on the reported ^{137}Cs LLD using a ratio determined from approved AK-NDA memoranda. ORNL-CCP states that ^{234}U is quantified by an algorithm based on measured values of ^{235}U, ^{238}U and ^{238}Pu and that it is not technically feasible to provide an LLD equivalent for ^{234}U.

6) PDP Participation

Technical Elements	Yes, No, NA	Comments and Objective Evidence
6-1) Has the IQ3 participated successfully in the CBFO NDA PDP? If so, identify the last cycle.	Yes	The IQ3 successfully participated in drum Cycle 24A of the CBFO NDA PDP by assaying two matrix drums: combustibles and glass, both containing WG Pu. This was documented in the CBFO approval notification dated 7-17-2017.

7) Training

Technical Elements	Yes, No, NA	Comments and Objective Evidence
7-1) Do all operators have current CCP training as verified on a LOQI?	Yes	ORNL-CCP provided copies of the LOQI for a series of dates that covered the time period within the scope of this inspection. The LOQIs listed IQ3 Operators, ITRs and EAs, and all were technically qualified and had current training.
7-2) Are IQ3 data reviewed and approved by qualified personnel? If so, identify the name of the individuals performing technical review and approval of IQ3 BDRs.	Yes	The BDRs listed in IQ3 checklist item 3-10 above were checked against the LOQI to confirm all individuals that functioned as Operators, ITRs or EAs had proper training. The following individuals functioned as Operator, ITR or EA in the three IQ3 BDRs selected: Dan Crosby, Ron Whitson, Chad Gerlock, Susan Anderson Dan Crosby no longer functions in the capacity of ITR or EA for the IQ3; however, at the time of his participation on IQ3 BDRs he was appropriately trained.

8) Replicate Testing

Technical Elements	Yes, No, NA	Comments and Objective Evidence
8-1) Has replicate testing of the IQ3 been performed, and does it meet the EPA Replicate Testing Protocol?	Yes	Replicate testing was requested for three containers: Drum Nos. X10C0901944, X10C0301194D and X10C9402644C. The data for the replicate tests of these containers did not show any values of significance for the χ^2 test. The *t* test for Drum No. X10C9402644C showed Highly Significant values for ^{137}Cs and ^{90}Sr. The five replicate values for ^{137}Cs are tightly grouped, and the actual difference between the original and the replicates is small. This is a weakness of the *t* test. ORNL personnel stated that these differences were likely due to fluctuations in the ^{137}Cs background from the movement of containers outside the buildings during the assays. Since ^{90}Sr is derived from the measured ^{137}Cs value, the ^{90}Sr value reflects the same variability. The *t* test for Drum No X10C0301194D showed Highly Significant values for ^{137}Cs, ^{90}Sr, ^{241}Am and ^{242}Pu. The five replicate values for ^{137}Cs and for ^{241}Am are tightly grouped, and the actual difference between the original and the replicates is small. This is a weakness of the *t* test. ORNL personnel stated that these differences were likely due to fluctuations in the ^{137}Cs background from container activities in the CHSA during the assays. Since ^{90}Sr is derived from the measured ^{137}Cs value, the ^{90}Sr value reflects the same variability. The original ^{242}Pu was 0 nCi, compared with a small positive value for the replicate analyses of 2 nCi.

ATTACHMENT D.1: REPLICATE TESTING DATA FOR DRUMS ASSAYED ON IQ3

Instrument: IQ3
Container: X10C0301194D

Quantity of Interest	Original Measurement			Replicate #1			Replicate #2		
	Reported Value	Absolute Uncertainty	Relative Uncertainty	Reported Value	Absolute Uncertainty	Relative Uncertainty	Reported Value	Absolute Uncertainty	Relative Uncertainty
^{90}Sr Activity (Ci)	3.73E-05	7.47E-06	20.0%	2.88E-05	5.78E-06	20.1%	2.89E-05	5.80E-06	20.1%
^{137}Cs Activity (Ci)	2.16E-06	4.33E-07	20.1%	1.67E-06	3.35E-07	20.1%	1.68E-06	3.36E-07	20.0%
^{233}U Activity (Ci)	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%
^{234}U Activity (Ci)	8.82E-07	1.85E-07	21.0%	9.94E-07	2.07E-07	20.8%	1.05E-06	2.20E-07	21.0%
^{235}U Activity (Ci)	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%
^{237}Np Activity (Ci)	1.15E-06	2.30E-07	20.0%	1.09E-06	2.18E-07	20.0%	1.13E-06	2.26E-07	20.0%
^{238}Pu Activity (Ci)	5.01E-03	1.05E-03	21.0%	5.65E-03	1.18E-03	20.9%	5.97E-03	1.25E-03	20.9%
^{238}U Activity (Ci)	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%
^{239}Pu Activity (Ci)	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%
^{240}Pu Activity (Ci)	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%
^{241}Am Activity (Ci)	7.01E-06	1.44E-06	20.5%	1.05E-05	2.14E-06	20.4%	1.03E-05	2.10E-06	20.4%
^{241}Pu Activity (Ci)	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%
^{242}Pu Activity (Ci)	0.00E+00	N/A	0.0%	1.73E-09	3.61E-10	20.9%	1.83E-09	3.82E-10	20.9%
TRU Alpha Conc. (nCi/g)	110	23	21.0%	124	26	20.8%	131	27	20.9%

Quantity of Interest	Replicate #3			Replicate #4			Replicate #5		
	Reported Value	Absolute Uncertainty	Relative Uncertainty	Reported Value	Absolute Uncertainty	Relative Uncertainty	Reported Value	Absolute Uncertainty	Relative Uncertainty
^{90}Sr Activity (Ci)	2.90E-05	5.81E-06	20.0%	2.89E-05	5.80E-06	20.1%	2.90E-05	5.80E-06	20.0%
^{137}Cs Activity (Ci)	1.68E-06	3.37E-07	20.1%	1.68E-06	3.36E-07	20.0%	1.68E-06	3.36E-07	20.0%
^{233}U Activity (Ci)	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%
^{234}U Activity (Ci)	9.53E-07	1.99E-07	20.9%	8.65E-07	1.82E-07	21.1%	1.03E-06	2.16E-07	21.0%
^{235}U Activity (Ci)	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%
^{237}Np Activity (Ci)	1.08E-06	2.16E-07	20.0%	1.08E-06	2.17E-07	20.1%	1.11E-06	2.23E-07	20.1%
^{238}Pu Activity (Ci)	5.42E-03	1.13E-03	20.9%	4.92E-03	1.04E-03	21.1%	5.88E-03	1.23E-03	20.9%
^{238}U Activity (Ci)	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%
^{239}Pu Activity (Ci)	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%
^{240}Pu Activity (Ci)	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%
^{241}Am Activity (Ci)	1.04E-05	2.12E-06	20.4%	1.04E-05	2.12E-06	20.4%	1.05E-05	2.15E-06	20.5%
^{241}Pu Activity (Ci)	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%
^{242}Pu Activity (Ci)	1.66E-09	3.46E-10	20.8%	1.50E-09	3.17E-10	21.1%	1.80E-09	3.75E-10	20.8%
TRU Alpha Conc. (nCi/g)	119	25	20.8%	108	19	17.6%	129	27	20.9%

Quantity of Interest	Original Measurement		Sample Mean	Sample Standard Deviation	Relative Standard Deviation	χ^2	Pr($x < \chi^2$)	t	Pr($x < \|t\|$)
	Reported Value	Absolute Uncertainty							
^{90}Sr Activity (Ci)	3.73E-05	7.47E-06	2.89E-05	8.37E-08	0.3%	0.001	1.000	91.433	0.000
^{137}Cs Activity (Ci)	2.16E-06	4.33E-07	1.68E-06	4.47E-09	0.3%	0.000	1.000	98.388	0.000
^{233}U Activity (Ci)	0.00E+00	N/A	0.00E+00	0.00E+00	N/A	N/A	N/A	N/A	N/A
^{234}U Activity (Ci)	8.82E-07	1.85E-07	9.78E-07	7.34E-08	7.5%	0.629	0.960	-1.199	0.297
^{235}U Activity (Ci)	0.00E+00	N/A	0.00E+00	0.00E+00	N/A	N/A	N/A	N/A	N/A
^{237}Np Activity (Ci)	1.15E-06	2.30E-07	1.10E-06	2.17E-08	2.0%	0.036	1.000	2.190	0.094
^{238}Pu Activity (Ci)	5.01E-03	1.05E-03	5.57E-03	4.21E-04	7.6%	0.642	0.958	-1.211	0.292
^{238}U Activity (Ci)	0.00E+00	N/A	0.00E+00	0.00E+00	N/A	N/A	N/A	N/A	N/A
^{239}Pu Activity (Ci)	0.00E+00	N/A	0.00E+00	0.00E+00	N/A	N/A	N/A	N/A	N/A
^{240}Pu Activity (Ci)	0.00E+00	N/A	0.00E+00	0.00E+00	N/A	N/A	N/A	N/A	N/A
^{241}Am Activity (Ci)	7.01E-06	1.44E-06	1.04E-05	8.37E-08	0.8%	0.014	1.000	-37.206	0.000
^{241}Pu Activity (Ci)	0.00E+00	N/A	0.00E+00	0.00E+00	N/A	N/A	N/A	N/A	N/A
^{242}Pu Activity (Ci)	0.00E+00	N/A	1.70E-09	1.32E-10	7.7%	N/A	N/A	-11.816	0.000
TRU Alpha Conc. (nCi/g)	110	23	122	9	7.5%	0.635	0.959	-1.210	0.293

Quantity of Interest	χ^2 Test	*t* Test
^{90}Sr Activity (Ci)	Not Significant	**Highly Significant**
^{137}Cs Activity (Ci)	Not Significant	**Highly Significant**
^{233}U Activity (Ci)	N/A	Not Applicable
^{234}U Activity (Ci)	Not Significant	Not Significant
^{235}U Activity (Ci)	N/A	Not Applicable
^{237}Np Activity (Ci)	Not Significant	Not Significant
^{238}Pu Activity (Ci)	Not Significant	Not Significant
^{238}U Activity (Ci)	N/A	Not Applicable
^{239}Pu Activity (Ci)	N/A	Not Applicable
^{240}Pu Activity (Ci)	N/A	Not Applicable
^{241}Am Activity (Ci)	Not Significant	**Highly Significant**
^{241}Pu Activity (Ci)	N/A	Not Applicable
^{242}Pu Activity (Ci)	N/A	**Highly Significant**
TRU Alpha Conc. (nCi/g)	Not Significant	Not Significant

Instrument: IQ3
Container: X10C0901944

Quantity of Interest	Original Measurement			Replicate #1			Replicate #2		
	Reported Value	Absolute Uncertainty	Relative Uncertainty	Reported Value	Absolute Uncertainty	Relative Uncertainty	Reported Value	Absolute Uncertainty	Relative Uncertainty
^{90}Sr Activity (Ci)	4.44E-05	7.30E-06	16.4%	4.35E-05	7.15E-06	16.4%	4.42E-05	7.26E-06	16.4%
^{137}Cs Activity (Ci)	2.58E-06	4.23E-07	16.4%	2.52E-06	4.15E-07	16.5%	2.56E-06	4.21E-07	16.4%
^{233}U Activity (Ci)	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%
^{234}U Activity (Ci)	1.06E-05	1.83E-06	17.3%	1.07E-05	1.84E-06	17.2%	1.11E-05	1.91E-06	17.2%
^{235}U Activity (Ci)	1.84E-07	3.18E-08	17.3%	1.86E-07	3.20E-08	17.2%	1.92E-07	3.31E-08	17.2%
^{237}Np Activity (Ci)	1.08E-06	1.77E-07	16.4%	1.04E-06	1.71E-07	16.4%	1.03E-06	1.69E-07	16.4%
^{238}Pu Activity (Ci)	2.99E-04	7.43E-05	24.9%	2.63E-04	6.50E-05	24.7%	2.57E-04	6.39E-05	24.9%
^{238}U Activity (Ci)	3.01E-05	4.96E-06	16.5%	3.02E-05	4.98E-06	16.5%	3.03E-05	5.00E-06	16.5%
^{239}Pu Activity (Ci)	3.14E-03	6.56E-04	20.9%	2.78E-03	5.77E-04	20.8%	2.72E-03	5.69E-04	20.9%
^{240}Pu Activity (Ci)	1.27E-03	3.21E-04	25.3%	1.13E-03	2.83E-04	25.0%	1.10E-03	2.78E-04	25.3%
^{241}Am Activity (Ci)	4.92E-03	8.48E-04	17.2%	4.63E-03	7.93E-04	17.1%	4.36E-03	7.49E-04	17.2%
^{241}Pu Activity (Ci)	8.17E-03	8.37E-03	102.5%	6.88E-03	1.73E-03	25.2%	6.73E-03	1.70E-03	25.3%
^{242}Pu Activity (Ci)	3.30E-07	8.35E-08	25.3%	2.92E-07	7.37E-08	25.2%	2.86E-07	7.25E-08	25.4%
TRU Alpha Conc. (nCi/g)	593	69	11.6%	543	63	11.6%	520	60	11.6%

Quantity of Interest	Replicate #3			Replicate #4			Replicate #5		
	Reported Value	Absolute Uncertainty	Relative Uncertainty	Reported Value	Absolute Uncertainty	Relative Uncertainty	Reported Value	Absolute Uncertainty	Relative Uncertainty
^{90}Sr Activity (Ci)	4.43E-05	7.27E-06	16.4%	4.39E-05	7.20E-06	16.4%	4.49E-05	7.37E-06	16.4%
^{137}Cs Activity (Ci)	2.57E-06	4.22E-07	16.4%	2.54E-06	4.18E-07	16.5%	2.60E-06	4.27E-07	16.4%
^{233}U Activity (Ci)	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%
^{234}U Activity (Ci)	1.03E-05	1.78E-06	17.3%	1.02E-05	1.71E-06	16.8%	1.05E-05	1.81E-06	17.2%
^{235}U Activity (Ci)	1.79E-07	3.10E-08	17.3%	1.76E-07	3.05E-08	17.3%	1.82E-07	3.14E-08	17.3%
^{237}Np Activity (Ci)	1.07E-06	1.77E-07	16.5%	1.02E-06	1.67E-07	16.4%	1.03E-06	1.70E-07	16.5%
^{238}Pu Activity (Ci)	2.41E-04	6.02E-05	25.0%	1.99E-04	5.03E-05	25.3%	2.00E-04	5.05E-05	25.3%
^{238}U Activity (Ci)	2.99E-05	4.93E-06	16.5%	3.11E-05	5.12E-06	16.5%	2.96E-05	4.89E-06	16.5%
^{239}Pu Activity (Ci)	2.55E-03	5.37E-04	21.1%	2.11E-03	4.51E-04	21.4%	2.12E-03	4.52E-04	21.3%
^{240}Pu Activity (Ci)	1.03E-03	2.62E-04	25.4%	8.55E-04	2.19E-04	25.6%	8.60E-04	2.20E-04	25.6%
^{241}Am Activity (Ci)	4.63E-03	7.92E-04	17.1%	5.10E-03	8.68E-04	17.0%	4.01E-03	6.94E-04	17.3%
^{241}Pu Activity (Ci)	6.31E-03	1.60E-03	25.4%	5.22E-03	1.34E-03	25.7%	5.24E-03	1.34E-03	25.6%
^{242}Pu Activity (Ci)	2.68E-07	6.82E-08	25.5%	2.22E-07	5.70E-08	25.7%	2.23E-07	5.72E-08	25.7%
TRU Alpha Conc. (nCi/g)	521	61	11.7%	510	62	12.1%	444	53	11.8%

Quantity of Interest	Original Measurement		Sample Mean	Sample Standard Deviation	Relative Standard Deviation	χ^2	Pr($x < \|\chi^2\|$)	t	Pr($x < \|t\|$)
	Reported Value	Absolute Uncertainty							
^{90}Sr Activity (Ci)	4.44E-05	7.30E-06	4.42E-05	5.18E-07	1.2%	0.020	1.000	0.423	0.694
^{137}Cs Activity (Ci)	2.58E-06	4.23E-07	2.56E-06	3.03E-08	1.2%	0.021	1.000	0.662	0.544
^{233}U Activity (Ci)	0.00E+00	N/A	0.00E+00	0.00E+00	N/A	N/A	N/A	N/A	N/A
^{234}U Activity (Ci)	1.06E-05	1.83E-06	1.06E-05	3.58E-07	3.4%	0.153	0.997	0.102	0.924
^{235}U Activity (Ci)	1.84E-07	3.18E-08	1.83E-07	6.24E-09	3.4%	0.154	0.997	0.146	0.891
^{237}Np Activity (Ci)	1.08E-06	1.77E-07	1.04E-06	1.92E-08	1.9%	0.047	1.000	1.993	0.117
^{238}Pu Activity (Ci)	2.99E-04	7.43E-05	2.32E-04	3.07E-05	13.3%	0.685	0.953	1.990	0.118
^{238}U Activity (Ci)	3.01E-05	4.96E-06	3.02E-05	5.63E-07	1.9%	0.052	1.000	-0.195	0.855
^{239}Pu Activity (Ci)	3.14E-03	6.56E-04	2.46E-03	3.23E-04	13.1%	0.967	0.915	1.936	0.125
^{240}Pu Activity (Ci)	1.27E-03	3.21E-04	9.95E-04	1.31E-04	13.1%	0.663	0.956	1.921	0.127
^{241}Am Activity (Ci)	4.92E-03	8.48E-04	4.55E-03	4.01E-04	8.8%	0.894	0.925	0.852	0.442
^{241}Pu Activity (Ci)	8.17E-03	8.37E-03	6.08E-03	8.00E-04	13.2%	0.037	1.000	2.389	0.075
^{242}Pu Activity (Ci)	3.30E-07	8.35E-08	2.58E-07	3.38E-08	13.1%	0.654	0.957	1.941	0.124
TRU Alpha Conc. (nCi/g)	593	69	508	38	7.4%	1.191	0.880	2.077	0.106

Quantity of Interest	χ^2 Test	*t* Test
^{90}Sr Activity (Ci)	Not Significant	Not Significant
^{137}Cs Activity (Ci)	Not Significant	Not Significant
^{233}U Activity (Ci)	N/A	Not Applicable
^{234}U Activity (Ci)	Not Significant	Not Significant
^{235}U Activity (Ci)	Not Significant	Not Significant
^{237}Np Activity (Ci)	Not Significant	Not Significant
^{238}Pu Activity (Ci)	Not Significant	Not Significant
^{238}U Activity (Ci)	Not Significant	Not Significant
^{239}Pu Activity (Ci)	Not Significant	Not Significant
^{240}Pu Activity (Ci)	Not Significant	Not Significant
^{241}Am Activity (Ci)	Not Significant	Not Significant
^{241}Pu Activity (Ci)	Not Significant	Not Significant
^{242}Pu Activity (Ci)	Not Significant	Not Significant
TRU Alpha Conc. (nCi/g)	Not Significant	Not Significant

Instrument: IQ3
Container: X10C9402644C

Quantity of Interest	Original Measurement			Replicate #1			Replicate #2		
	Reported Value	Absolute Uncertainty	Relative Uncertainty	Reported Value	Absolute Uncertainty	Relative Uncertainty	Reported Value	Absolute Uncertainty	Relative Uncertainty
^{90}Sr Activity (Ci)	7.49E-03	1.31E-03	17.5%	7.14E-03	1.25E-03	17.4%	7.13E-03	1.25E-03	17.5%
^{137}Cs Activity (Ci)	4.34E-04	7.60E-05	17.5%	4.14E-04	7.24E-05	17.5%	4.14E-04	7.23E-05	17.5%
^{233}U Activity (Ci)	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%
^{234}U Activity (Ci)	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%
^{235}U Activity (Ci)	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%
^{237}Np Activity (Ci)	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%
^{238}Pu Activity (Ci)	1.71E-04	1.46E-04	85.4%	1.71E-04	1.47E-04	86.2%	1.71E-04	1.47E-04	86.0%
^{238}U Activity (Ci)	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%
^{239}Pu Activity (Ci)	2.11E-07	2.49E-07	118.0%	2.10E-07	2.48E-07	117.9%	2.10E-07	2.48E-07	118.1%
^{240}Pu Activity (Ci)	4.50E-05	3.51E-05	78.0%	4.51E-05	3.52E-05	78.1%	4.51E-05	3.52E-05	78.1%
^{241}Am Activity (Ci)	3.44E-03	6.13E-04	17.8%	3.27E-03	5.84E-04	17.9%	3.27E-03	5.83E-04	17.8%
^{241}Pu Activity (Ci)	1.40E-03	1.71E-03	122.1%	1.40E-03	1.71E-03	122.3%	1.40E-03	1.71E-03	122.1%
^{242}Pu Activity (Ci)	2.29E-06	2.13E-06	93.0%	2.31E-06	2.14E-06	92.6%	2.31E-06	2.14E-06	92.6%
^{243}Am Activity (Ci)	3.14E-05	5.51E-06	17.6%	3.15E-05	5.51E-06	17.5%	3.15E-05	5.51E-06	17.5%
TRU Alpha Conc. (nCi/g)	123	21	17.1%	117	20	17.1%	118	19	16.4%

Quantity of Interest	Replicate #3			Replicate #4			Replicate #5		
	Reported Value	Absolute Uncertainty	Relative Uncertainty	Reported Value	Absolute Uncertainty	Relative Uncertainty	Reported Value	Absolute Uncertainty	Relative Uncertainty
^{90}Sr Activity (Ci)	7.14E-03	1.25E-03	17.4%	7.14E-03	1.25E-03	17.5%	7.12E-03	1.24E-03	17.4%
^{137}Cs Activity (Ci)	4.14E-04	7.24E-05	17.5%	4.14E-04	7.24E-05	17.5%	4.13E-04	7.22E-05	17.5%
^{233}U Activity (Ci)	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%
^{234}U Activity (Ci)	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%
^{235}U Activity (Ci)	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%
^{237}Np Activity (Ci)	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%
^{238}Pu Activity (Ci)	1.75E-04	1.51E-04	86.1%	1.72E-04	1.48E-04	85.9%	1.74E-04	1.49E-04	85.6%
^{238}U Activity (Ci)	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%
^{239}Pu Activity (Ci)	2.15E-07	2.54E-07	118.1%	2.11E-07	2.50E-07	118.5%	2.13E-07	2.52E-07	118.5%
^{240}Pu Activity (Ci)	4.62E-05	3.60E-05	77.9%	4.54E-05	3.54E-05	78.0%	4.58E-05	3.57E-05	78.0%
^{241}Am Activity (Ci)	3.27E-03	5.84E-04	17.9%	3.30E-03	5.89E-04	17.9%	3.14E-03	5.61E-04	17.9%
^{241}Pu Activity (Ci)	1.43E-03	1.75E-03	122.5%	1.41E-03	1.72E-03	122.0%	1.42E-03	1.73E-03	121.8%
^{242}Pu Activity (Ci)	2.36E-06	2.20E-06	93.0%	2.32E-06	2.16E-06	93.1%	2.34E-06	2.18E-06	93.0%
^{243}Am Activity (Ci)	3.22E-05	5.65E-06	17.6%	3.17E-05	5.55E-06	17.5%	3.19E-05	5.59E-06	17.5%
TRU Alpha Conc. (nCi/g)	118	19	16.4%	119	20	17.0%	114	19	17.0%

Quantity of Interest	Original Measurement		Sample Mean	Sample Standard Deviation	Relative Standard Deviation	χ^2	Pr($x < \|\chi^2\|$)	t	Pr($x < \|t\|$)
	Reported Value	Absolute Uncertainty							
^{90}Sr Activity (Ci)	7.49E-03	1.31E-03	7.13E-03	8.94E-06	0.1%	0.000	1.000	36.334	0.000
^{137}Cs Activity (Ci)	4.34E-04	7.60E-05	4.14E-04	4.47E-07	0.1%	0.000	1.000	41.233	0.000
^{233}U Activity (Ci)	0.00E+00	N/A	0.00E+00	0.00E+00	N/A	N/A	N/A	N/A	N/A
^{234}U Activity (Ci)	0.00E+00	N/A	0.00E+00	0.00E+00	N/A	N/A	N/A	N/A	N/A
^{235}U Activity (Ci)	0.00E+00	N/A	0.00E+00	0.00E+00	N/A	N/A	N/A	N/A	N/A
^{237}Np Activity (Ci)	0.00E+00	N/A	0.00E+00	0.00E+00	N/A	N/A	N/A	N/A	N/A
^{238}Pu Activity (Ci)	1.71E-04	1.46E-04	1.73E-04	1.82E-06	1.1%	0.001	1.000	-0.804	0.466
^{238}U Activity (Ci)	0.00E+00	N/A	0.00E+00	0.00E+00	N/A	N/A	N/A	N/A	N/A
^{239}Pu Activity (Ci)	2.11E-07	2.49E-07	2.12E-07	2.17E-09	1.0%	0.000	1.000	-0.337	0.753
^{240}Pu Activity (Ci)	4.50E-05	3.51E-05	4.55E-05	4.76E-07	1.0%	0.001	1.000	-0.996	0.375
^{241}Am Activity (Ci)	3.44E-03	6.13E-04	3.25E-03	6.28E-05	1.9%	0.042	1.000	2.760	0.051
^{241}Pu Activity (Ci)	1.40E-03	1.71E-03	1.41E-03	1.30E-05	0.9%	0.000	1.000	-0.840	0.448
^{242}Pu Activity (Ci)	2.29E-06	2.13E-06	2.33E-06	2.17E-08	0.9%	0.000	1.000	-1.600	0.185
^{243}Am Activity (Ci)	3.14E-05	5.51E-06	3.18E-05	2.97E-07	0.9%	0.012	1.000	-1.108	0.330
TRU Alpha Conc. (nCi/g)	123	21	117	2	1.6%	0.034	1.000	2.753	0.051

Quantity of Interest	χ^2 Test	*t* Test
^{90}Sr Activity (Ci)	Not Significant	**Highly Significant**
^{137}Cs Activity (Ci)	Not Significant	**Highly Significant**
^{233}U Activity (Ci)	N/A	Not Applicable
^{234}U Activity (Ci)	N/A	Not Applicable
^{235}U Activity (Ci)	N/A	Not Applicable
^{237}Np Activity (Ci)	N/A	Not Applicable
^{238}Pu Activity (Ci)	Not Significant	Not Significant
^{238}U Activity (Ci)	N/A	Not Applicable
^{239}Pu Activity (Ci)	Not Significant	Not Significant
^{240}Pu Activity (Ci)	Not Significant	Not Significant
^{241}Am Activity (Ci)	Not Significant	Not Significant
^{241}Pu Activity (Ci)	Not Significant	Not Significant
^{242}Pu Activity (Ci)	Not Significant	Not Significant
^{243}Am Activity (Ci)	Not Significant	Not Significant
TRU Alpha Conc. (nCi/g)	Not Significant	Not Significant

ATTACHMENT E: MOBILE ISOCS LARGE CONTAINER COUNTER 2 CONTINUED COMPLIANCE INSPECTION CHECKLIST

EPA Inspection No.: CCP-ORNL-CC-2018 **Inspection Date: March 6–8, 2018**

1) General System Attributes

Technical Element/Aspect	Yes, No, NA	Comments and Objective Evidence
1-1) Is the MILCC2 the same system previously approved by the EPA, and is it in the same location?	Yes	The instrument is in Building (trailer) 7880AC at the TWPC at ORNL. MILCC2 stands for Mobile ISOCS Large Container Counter-2, also referred to as the Oak Ridge MILC Counter in the TMU documentation. This was confirmed with NDA personnel during evaluation. EPA inspectors visually confirmed the instrument's location.
1-2) Is the MILCC2 unchanged, i.e., there are no significant departures from what the EPA had approved previously?	Yes	There were no significant changes to the MILCC2 relative to the EPA's previous approval of the system. The only changes to the MILCC2 are documented in the one calibration verification and are discussed in MILCC2 checklist item 3-7 below.

2) System Performance

Technical Element/Aspect	Yes, No, NA	Comments and Objective Evidence
2-1) Are the containers, types of TRU waste, and the operational parameters within the ranges that the EPA has approved for the MILCC2?	Yes	The MILCC2 operational range consists of gamma-based assays of debris, soils, gravel and homogeneous solid wastes in 55-gallon drums. The MILCC2 is limited by waste density and dead time, calibrated to assay wastes with densities of 0–2.50 g/cc**.** All ORNL TRU wastes are expected to be within the ranges of the EPA's approval. By virtue of design, the MILCC2 is capable of assaying drums with higher dose rates and corresponding dead time.
2-2) How many waste containers (and number of BDRs) were assayed by the MILCC2 since the time of the last approval?	NA	Since the 2016 EPA continued compliance inspection, the ORNL-CCP MILCC2 has assayed approximately 660 drums that have been complied in 66 MILCC2 BDRs. ORNL-CCP states the majority of these assays have been WIPP eligible; i.e., >100 nCi/g TAAC.
2-3) Is the MILCC2 able to report quantitative values and uncertainties for the WIPP-tracked radionuclides?	Yes	During the evaluation, ORNL-CCP NDA personnel confirmed the following: • Directly measured radionuclides: ^{238}Pu, ^{239}Pu, ^{241}Am, ^{233}U, ^{235}U, ^{238}U, ^{137}Cs and ^{237}Np • Radionuclides scaled to directly measured radionuclides: ^{90}Sr, ^{234}U and ^{242}Pu • Isotopic ratios are determined by MGA or FRAM, or approved AK isotopic profiles
2-4) Have background measurements been taken each operational day? Have any instances of problematic background radiation been documented?	Yes	Background measurements were taken daily, as confirmed by MILCC2 logbook entries in ORNL-TWPC-BLDG 7880, Operational Logbook 2018-02. While background at the site is not necessarily a problem, the staging/movement of high-dose-rate waste containers near the MILCC2 trailer may affect background temporarily. ORNL-CCP NDA personnel are experienced in addressing these situations adequately.

Technical Element/Aspect	Yes, No, NA	Comments and Objective Evidence
2-5) Have system performance checks been completed at least once per operational day? Are the procedures for the performance checks technically adequate for the MILCC2?	Yes	Performance checks were done daily, as confirmed by MILCC2 logbook entries in ORNL-TWPC-BLDG 7880, Operational Logbook 2018-02, and MILCC2 BDRs listed in MILCC2 checklist item 3-10 below.

3) System Calibration & Calibration Verifications

Technical Element/Aspect	Yes, No, NA	Comments and Objective Evidence
3-1) Does the MILCC2 have a calibration of record? Were consensus standards used in the initial calibration? If so, which standards?	Yes	The calibration of record is documented in CI-MILCC2-NDA-1001, Revision A. The reports for each detector's factory characterization (performed at Canberra in Meriden, CT) were provided. The EPA reviewers found them to be unchanged since the EPA's last inspection and technically adequate. The MILCC2 calibration is based on consensus standards ASTM C-1030, C-1133, C-1207 and C-1500.
3-2) Are the calibration, execution of performance checks and operation of the MILCC2, the calculation of radionuclide values and the review/validation of MILCC2 data governed by controlled-copy (formal) procedures?	Yes	All pertinent MILCC2 functions are governed by formal CCP procedures, as follows: • CCP-TP-076, CCP Operating the Mobile ISOCS Large Container Counter Using NDA 2000 (Revision 2, 7-22-2016) • CCP-TP-077, CCP Calibrating the Mobile ISOCS Large Container Counter Using NDA 2000 (Revision 2, 7-22-2016) • CCP-TP-048, CCP ORNL NDA System Data Reviewing, Validating, and Reporting Procedure (Revision 17, 7-22-2016)
3-3) Are the current revisions of procedures in use for the MILCC2?	Yes	The EPA observed that the current revisions of CCP-TP-076 and CCP-TP-077 were available in the MILCC2 control room for the Operators' use. MILCC2 Operators verify the current revision of the procedures daily, as documented in the MILCC2 operating logbook.
3-4) Are the isotopic contributions of unmeasured radionuclides derived using a certain method?	Yes	During the inspection, ORNL-CCP personnel confirmed that the isotopic distributions of ^{241}Am and Pu radionuclides are determined by MGA or FRAM software, when sufficient radionuclide masses are present. ORNL-CCP also uses approved isotopic distributions, as required by the EA. The EPA determined this was unchanged since the EPA's last inspection and was technically adequate.
3-5) Were traceable radionuclide sources used for calibration confirmation and/or verifications? If so, list or reference all standards used.	Yes	Sources are summarized in Table 6.1 of CI-MILCC2-NDA-1001, Revision A, with source certificates in Attachment 1. All sources are traceable to the national standards base and are acceptable for the MILCC2 calibration and calibration confirmation and/or verification.
3-6) Have the operational ranges with respect to matrix (density) and activity been determined for the MILCC2?	Yes	Acceptable density range is approximately 0.01–2.50 g/cc; activity is limited by spectral parameters (peak shape and resolution) and system dead time. This was confirmed with NDA personnel during evaluation.

Technical Element/Aspect	Yes, No, NA	Comments and Objective Evidence
3-7) Has a calibration verification been completed for the MILCC2? If so, what is the date of the last calibration verification? Have any others been completed in the last year?	Yes	One calibration verification was performed since the last inspection, as documented in CI-MILCC2-NDA-1009, Revision 0, which the EPA reviewed. The calibration verification documented in CI-MILCC2-NDA-1009 was required due to an action flag during a routine performance check. Following this, Detector Nos. 1 and 2 had prematurely warmed up and were returned to the factory for repair. Upon reinstallation of the detectors, ORNL-CCP performed a calibration verification and established new quality control baseline values. All parameters were acceptable, and the MILCC2 was returned to service.
3-8) Does the MILCC2 meet the requirements for accuracy and precision as specified in DOE/WIPP-02-3122, Appendix A, Table A-2, for calibration verifications?	Yes	CI-MILCC2-CAL-NDA-1003, Revision 0, documents the calibration confirmation was acceptable; i.e., the %R was between 90 and 110% and the %RSD was less than 6.6% for three replicates, as required. This was confirmed with NDA personnel during the EPA evaluation.
3-9) Have any NCRs related to the MILCC2 been issued since the last EPA continued compliance inspection?	Yes	There were no NCRs attributable to the MILCC2. ORNL-CCP requires the generation of an NCR for any assay that indicates a container is not TRU (i.e., less than 100 nCi/g TAAC); however, these NCRs are typically not relevant to the EPA's technical evaluation.
3-10) Do the BDRs contain: • Testing facility name, testing batch number, container numbers, and signature of the SPM or designee • Table of contents • Background and performance check data or control charts for the relevant time period • Separate testing report sheets for each container	Yes	The EPA requested three MILCC2 BDRs randomly selected from a list of all BDRs since the last inspection. All BDRs reviewed were found to contain the required information. OR-MILCC2-0389, OR-MILCC2-0401, OR-MILCC2-0407
3-11) Do the RDSs include: • Title "Radioassay Data Sheet" • Method/procedure used • Date of radioassay • Activities and associated TMU for individual radionuclides • TRU alpha concentration and its associated TMU • Operator and reviewer signatures	Yes	RDSs from BDRs were found to contain required information. OR-MILCC2-0389, OR-MILCC2-0401, OR-MILCC2-0407

4) Total Measurement Uncertainty

Technical Element/Aspect	Yes, No, NA	Comments and Objective Evidence
4-1) Was the TMU document updated to reflect guidance from the previous inspection?	NA	There was no pertinent revision from the EPA's last inspection.

Technical Element/Aspect	Yes, No, NA	Comments and Objective Evidence
4-2) Is the TMU method unchanged since the previous inspection?	Yes	The TMU has not been revised since the last inspection in 2016. The first revision (Revision A, 8-15-2014) was performed to include information requested by the EPA in the 2016 continued compliance inspection. The most recent revision (Revision B, March 11, 2015) includes an addendum to address TMU for pipe overpack containers (POCs). POCs are not currently covered under ORNL-CCP's certified program, and the EPA did not evaluate this addendum. **The MILCC2 is not approved to assay POCs at this time.**
4-3) Is the magnitude of the TMU values observed in the MILCC2 BDRs examined during the inspection within the expected range?	Yes	This was confirmed in reviewed BDRs listed in MILCC2 checklist item 3-10 above.

5) Lower Limit of Detection

Technical Element/Aspect	Yes, No, NA	Comments and Objective Evidence
5-1) Has the LLD for the MILCC2 has been determined? Is the LLD determination appropriate for the types of TRU waste ORNL-CCP expects to assay on the MILCC2? Is the technical basis for the LLD determination documented?	Yes	ORNL-CCP determined MDAs by performing replicate assays of each matrix for all three detector positions with containers without radioactive sources. MDA values were then averaged and converted to MDCs using matrix weights. MDAs vary as a function of background, measurement time and matrix. ORNL-CCP provided example MDAs and MDCs for metals, combustibles and sludge in 55-gallon drums in all three detector positions, as documented in CI-MILCC2-NDA-1001. The MILCC2 meets the TRU discrimination criterion of 100 nCi/g only for the Near-Field configuration. As expected, ORNL-CCP personnel stated that they will assay all low-activity containers at the Near-Field position because TRU determinations at the Mid- and Far-Field positions may not be possible for low activity drums. ORNL-CCP does not intend to use the MILCC2 for TRU/non TRU determinations.
5-2) Is the MILCC2 used to discriminate TRU/non-TRU wastes at the 100 nCi/g criterion? If so, does the MILCC2 have the required sensitivity?	Yes	See previous entry.
5-3) Are there any instances where an LLD value for a non-measured radionuclide is not provided based on a lack of technical feasibility?	Yes	Reporting thresholds are not discussed in the calibration report but are reported in ORNL-CCP NDA memoranda. Because the LLD is a measurement-based parameter, ORNL-CCP personnel stated that it is not technically feasible to calculate an LLD equivalent for radionuclides that are not directly measured, i.e., ^{242}Pu, ^{234}U and ^{90}Sr.

6) PDP Participation

Technical Element/Aspect	Yes, No, NA	Comments and Objective Evidence
6-1) Has the MILCC2 participated successfully in the CBFO NDA PDP? If so, identify the last cycle.	Yes	The MILCC2 successfully participated in drum Cycle 24A of the CBFO NDA PDP by assaying two matrix drums: combustibles and glass, both containing WG Pu. This was documented in the CBFO approval notification dated 7-17-2017.

7) Training

Technical Element/Aspect	Yes, No, NA	Comments and Objective Evidence
7-1) Do all operators have current CCP training as verified on an LOQI?	Yes	ORNL-CCP provided copies of the LOQI for a series of dates that covered the time period within the scope of this inspection. The LOQIs listed MILCC2 Operators, ITRs and EAs, and all were technically qualified and had current training.
7-2) Are MILCC2 data reviewed and approved by qualified personnel? If so, identify the name of the individuals performing technical review and approval of MILCC2 BDRs.	Yes	The BDRs listed in MILCC2 checklist item 3-10 above were checked against the LOQI to confirm all individuals that functioned as Operators, ITRs or EAs had proper training. The following individuals functioned as Operator, ITR or EA in the three MILCC2 BDRs selected: Dan Crosby, Ron Whitson, Chad Gerlock and Susan Anderson. Dan Crosby no longer functions in the capacity of ITR or EA for the MILCC2; however, at the time of his participation on two MILCC2 BDRs he was appropriately trained.

8) Replicate Testing

Technical Element/Aspect	Yes, No, NA	Comments and Objective Evidence
8-1) Has replicate testing of the MILCC2 been performed, and does it meet the EPA Replicate Testing Protocol?	Yes	Replicate testing was requested for three containers: Drum Nos. X10C0402918BO1, X10C9312286A and X10C9402644Q. The data for the replicate tests of these containers did not show any values of significance for the χ^2 test. The *t* test for Drum Nos. X10C9312286A and X10C9402644Q both showed Highly Significant values for ^{137}Cs and ^{90}Sr. The five replicate values for ^{137}Cs for both drums are tightly grouped, and the actual differences between the originals and the replicates are small. This is a weakness of the *t* test. ORNL personnel stated that these differences were likely due to fluctuations in the ^{137}Cs background from the movement of containers near the MILCC2 during the assays. Since ^{90}Sr is derived from the measured ^{137}Cs value, the ^{90}Sr value reflects the same variability.

ATTACHMENT E.1: REPLICATE TESTING DATA FOR DRUMS ASSAYED ON MILCC2

Instrument: MILCC2
Container: X10C0402918BO1

Quantity of Interest	Original Measurement			Replicate #1			Replicate #2		
	Reported Value	Absolute Uncertainty	Relative Uncertainty	Reported Value	Absolute Uncertainty	Relative Uncertainty	Reported Value	Absolute Uncertainty	Relative Uncertainty
^{90}Sr Activity (Ci)	2.22E-02	3.22E-03	14.5%	2.21E-02	1.62E-03	7.3%	2.21E-02	1.62E-03	7.3%
^{137}Cs Activity (Ci)	1.28E-03	1.86E-04	14.5%	1.28E-03	9.38E-05	7.3%	1.28E-03	9.40E-05	7.3%
^{233}U Activity (Ci)	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%
^{234}U Activity (Ci)	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%
^{235}U Activity (Ci)	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%
^{237}Np Activity (Ci)	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%
^{238}Pu Activity (Ci)	2.44E-04	3.42E-04	140.2%	2.44E-04	3.41E-04	139.8%	2.50E-04	3.48E-04	139.2%
^{238}U Activity (Ci)	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%
^{239}Pu Activity (Ci)	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%
^{240}Pu Activity (Ci)	5.77E-03	8.08E-03	140.0%	5.78E-03	8.06E-03	139.5%	5.91E-03	8.24E-03	139.4%
^{241}Am Activity (Ci)	4.82E-01	8.65E-02	18.0%	5.57E-01	5.77E-02	10.4%	5.86E-01	5.45E-02	9.3%
^{241}Pu Activity (Ci)	4.21E-04	5.89E-04	139.9%	4.21E-04	5.87E-04	139.4%	4.31E-04	6.00E-04	139.2%
^{242}Pu Activity (Ci)	1.37E-06	1.92E-06	140.2%	1.37E-06	1.91E-06	139.4%	1.40E-06	1.96E-06	140.0%
^{243}Am Activity (Ci)	3.24E-04	4.73E-05	14.6%	3.25E-04	2.42E-05	7.4%	3.32E-04	2.48E-05	7.5%
TRU Alpha Conc. (nCi/g)	6,650	1,170	17.6%	7,660	790	10.3%	8,050	749	9.3%

Quantity of Interest	Replicate #3			Replicate #4			Replicate #5		
	Reported Value	Absolute Uncertainty	Relative Uncertainty	Reported Value	Absolute Uncertainty	Relative Uncertainty	Reported Value	Absolute Uncertainty	Relative Uncertainty
^{90}Sr Activity (Ci)	2.21E-02	1.62E-03	7.3%	2.21E-02	1.62E-03	7.3%	2.21E-02	1.62E-03	7.3%
^{137}Cs Activity (Ci)	1.28E-03	9.36E-05	7.3%	1.28E-03	9.39E-05	7.3%	1.28E-03	9.40E-05	7.3%
^{233}U Activity (Ci)	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%
^{234}U Activity (Ci)	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%
^{235}U Activity (Ci)	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%
^{237}Np Activity (Ci)	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%
^{238}Pu Activity (Ci)	2.44E-04	3.40E-04	139.3%	2.45E-04	3.41E-04	139.3%	2.42E-04	3.38E-04	139.7%
^{238}U Activity (Ci)	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%
^{239}Pu Activity (Ci)	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%
^{240}Pu Activity (Ci)	5.76E-03	8.04E-03	139.6%	5.79E-03	8.07E-03	139.4%	5.73E-03	7.99E-03	139.4%
^{241}Am Activity (Ci)	5.46E-01	6.29E-02	11.5%	4.68E-01	5.86E-02	12.5%	5.92E-01	6.08E-02	10.3%
^{241}Pu Activity (Ci)	4.20E-04	5.86E-04	139.5%	4.22E-04	5.88E-04	139.3%	4.17E-04	5.82E-04	139.6%
^{242}Pu Activity (Ci)	1.37E-06	1.91E-06	139.4%	1.37E-06	1.91E-06	139.4%	1.36E-06	1.89E-06	139.0%
^{243}Am Activity (Ci)	3.24E-04	2.41E-05	7.4%	3.25E-04	2.42E-05	7.4%	3.22E-04	2.40E-05	7.5%
TRU Alpha Conc. (nCi/g)	7,510	860	11.5%	6,460	802	12.4%	8,130	831	10.2%

Quantity of Interest	Original Measurement		Sample Mean	Sample Standard Deviation	Relative Standard Deviation	χ^2	Pr($x < \lvert\chi^2\rvert$)	t	Pr($x < \lvert t \rvert$)
	Reported Value	Absolute Uncertainty							
^{90}Sr Activity (Ci)	2.22E-02	3.22E-03	2.21E-02	0.00E+00	N/A	0.000	1.000	N/A	N/A
^{137}Cs Activity (Ci)	1.28E-03	1.86E-04	1.28E-03	0.00E+00	N/A	0.000	1.000	N/A	N/A
^{233}U Activity (Ci)	0.00E+00	N/A	0.00E+00	0.00E+00	N/A	N/A	N/A	N/A	N/A
^{234}U Activity (Ci)	0.00E+00	N/A	0.00E+00	0.00E+00	N/A	N/A	N/A	N/A	N/A
^{235}U Activity (Ci)	0.00E+00	N/A	0.00E+00	0.00E+00	N/A	N/A	N/A	N/A	N/A
^{237}Np Activity (Ci)	0.00E+00	N/A	0.00E+00	0.00E+00	N/A	N/A	N/A	N/A	N/A
^{238}Pu Activity (Ci)	2.44E-04	3.42E-04	2.45E-04	3.00E-06	1.2%	0.000	1.000	-0.304	0.776
^{238}U Activity (Ci)	0.00E+00	N/A	0.00E+00	0.00E+00	N/A	N/A	N/A	N/A	N/A
^{239}Pu Activity (Ci)	0.00E+00	N/A	0.00E+00	0.00E+00	N/A	N/A	N/A	N/A	N/A
^{240}Pu Activity (Ci)	5.77E-03	8.08E-03	5.79E-03	6.88E-05	1.2%	0.000	1.000	-0.319	0.766
^{241}Am Activity (Ci)	4.82E-01	8.65E-02	5.50E-01	4.96E-02	9.0%	1.316	0.859	-1.247	0.280
^{241}Pu Activity (Ci)	4.21E-04	5.89E-04	4.22E-04	5.26E-06	1.2%	0.000	1.000	-0.208	0.845
^{242}Pu Activity (Ci)	1.37E-06	1.92E-06	1.37E-06	1.52E-08	1.1%	0.000	1.000	-0.241	0.822
^{243}Am Activity (Ci)	3.24E-04	4.73E-05	3.26E-04	3.78E-06	1.2%	0.026	1.000	-0.386	0.719
TRU Alpha Conc. (nCi/g)	6,650	1,170	7,562	668	8.8%	1.306	0.860	-1.245	0.281

Quantity of Interest	χ^2 Test	*t* Test
^{90}Sr Activity (Ci)	Not Significant	Not Applicable
^{137}Cs Activity (Ci)	Not Significant	Not Applicable
^{233}U Activity (Ci)	N/A	Not Applicable
^{234}U Activity (Ci)	N/A	Not Applicable
^{235}U Activity (Ci)	N/A	Not Applicable
^{237}Np Activity (Ci)	N/A	Not Applicable
^{238}Pu Activity (Ci)	Not Significant	Not Significant
^{238}U Activity (Ci)	N/A	Not Applicable
^{239}Pu Activity (Ci)	N/A	Not Applicable
^{240}Pu Activity (Ci)	Not Significant	Not Significant
^{241}Am Activity (Ci)	Not Significant	Not Significant
^{241}Pu Activity (Ci)	Not Significant	Not Significant
^{242}Pu Activity (Ci)	Not Significant	Not Significant
^{243}Am Activity (Ci)	Not Significant	Not Significant
TRU Alpha Conc. (nCi/g)	Not Significant	Not Significant

Instrument: MILCC2
Container: X10C9312286A

Quantity of Interest	Original Measurement			Replicate #1			Replicate #2		
	Reported Value	Absolute Uncertainty	Relative Uncertainty	Reported Value	Absolute Uncertainty	Relative Uncertainty	Reported Value	Absolute Uncertainty	Relative Uncertainty
^{90}Sr Activity (Ci)	3.10E-05	7.99E-07	2.6%	7.08E-06	4.01E-07	5.7%	7.60E-06	3.87E-07	5.1%
^{137}Cs Activity (Ci)	3.10E-05	7.99E-07	2.6%	7.08E-06	4.01E-07	5.7%	7.60E-06	3.87E-07	5.1%
^{233}U Activity (Ci)	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%
^{234}U Activity (Ci)	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%
^{235}U Activity (Ci)	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%
^{237}Np Activity (Ci)	3.81E-05	1.25E-06	3.3%	3.90E-05	1.25E-06	3.2%	3.57E-05	1.09E-06	3.1%
^{238}Pu Activity (Ci)	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%
^{238}U Activity (Ci)	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%
^{239}Pu Activity (Ci)	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%
^{240}Pu Activity (Ci)	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%
^{241}Am Activity (Ci)	2.77E-02	8.78E-04	3.2%	2.86E-02	9.08E-04	3.2%	2.61E-02	7.40E-04	2.8%
^{241}Pu Activity (Ci)	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%
^{242}Pu Activity (Ci)	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%
^{243}Am Activity (Ci)	6.07E-02	1.28E-03	2.1%	6.07E-02	1.27E-03	2.1%	5.71E-02	8.85E-04	1.6%
^{243}Cm Activity (Ci)	2.03E-02	7.72E-04	3.8%	2.03E-02	7.71E-04	3.8%	2.19E-02	6.87E-04	3.1%
TRU Alpha Conc. (nCi/g)	4,660	74	1.6%	4,700	75	1.6%	4,500	57	1.3%

Quantity of Interest	Replicate #3			Replicate #4			Replicate #5		
	Reported Value	Absolute Uncertainty	Relative Uncertainty	Reported Value	Absolute Uncertainty	Relative Uncertainty	Reported Value	Absolute Uncertainty	Relative Uncertainty
^{90}Sr Activity (Ci)	6.96E-06	4.10E-07	5.9%	6.78E-06	4.08E-07	6.0%	7.09E-06	4.21E-07	5.9%
^{137}Cs Activity (Ci)	6.96E-06	4.10E-07	5.9%	6.78E-06	4.08E-07	6.0%	7.09E-06	4.21E-07	5.9%
^{233}U Activity (Ci)	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%
^{234}U Activity (Ci)	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%
^{235}U Activity (Ci)	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%
^{237}Np Activity (Ci)	3.95E-05	1.26E-06	3.2%	3.89E-05	1.26E-06	3.2%	3.79E-05	1.23E-06	3.2%
^{238}Pu Activity (Ci)	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%
^{238}U Activity (Ci)	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%
^{239}Pu Activity (Ci)	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%
^{240}Pu Activity (Ci)	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%
^{241}Am Activity (Ci)	2.85E-02	9.04E-04	3.2%	2.81E-02	8.93E-04	3.2%	2.82E-02	8.97E-04	3.2%
^{241}Pu Activity (Ci)	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%
^{242}Pu Activity (Ci)	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%
^{243}Am Activity (Ci)	6.04E-02	1.27E-03	2.1%	6.03E-02	1.27E-03	2.1%	6.08E-02	1.28E-03	2.1%
^{243}Cm Activity (Ci)	2.13E-02	7.79E-04	3.7%	2.17E-02	7.83E-04	3.6%	2.08E-02	7.75E-04	3.7%
TRU Alpha Conc. (nCi/g)	4,730	75	1.6%	4,730	74	1.6%	4,710	69	1.5%

Quantity of Interest	Original Measurement		Sample Mean	Sample Standard Deviation	Relative Standard Deviation	χ^2	Pr($x < \|\chi^2\|$)	t	Pr($x < \|t\|$)
	Reported Value	Absolute Uncertainty							
^{90}Sr Activity (Ci)	3.10E-05	7.99E-07	7.10E-06	3.05E-07	4.3%	0.584	0.965	71.491	0.000
^{137}Cs Activity (Ci)	3.10E-05	7.99E-07	7.10E-06	3.05E-07	4.3%	0.584	0.965	71.491	0.000
^{233}U Activity (Ci)	0.00E+00	N/A	0.00E+00	0.00E+00	N/A	N/A	N/A	N/A	N/A
^{234}U Activity (Ci)	0.00E+00	N/A	0.00E+00	0.00E+00	N/A	N/A	N/A	N/A	N/A
^{235}U Activity (Ci)	0.00E+00	N/A	0.00E+00	0.00E+00	N/A	N/A	N/A	N/A	N/A
^{237}Np Activity (Ci)	3.81E-05	1.25E-06	3.82E-05	1.51E-06	4.0%	5.865	0.209	-0.060	0.955
^{238}Pu Activity (Ci)	0.00E+00	N/A	0.00E+00	0.00E+00	N/A	N/A	N/A	N/A	N/A
^{238}U Activity (Ci)	0.00E+00	N/A	0.00E+00	0.00E+00	N/A	N/A	N/A	N/A	N/A
^{239}Pu Activity (Ci)	0.00E+00	N/A	0.00E+00	0.00E+00	N/A	N/A	N/A	N/A	N/A
^{240}Pu Activity (Ci)	0.00E+00	N/A	0.00E+00	0.00E+00	N/A	N/A	N/A	N/A	N/A
^{241}Am Activity (Ci)	2.77E-02	8.78E-04	2.79E-02	1.03E-03	3.7%	5.473	0.242	-0.178	0.868
^{241}Pu Activity (Ci)	0.00E+00	N/A	0.00E+00	0.00E+00	N/A	N/A	N/A	N/A	N/A
^{242}Pu Activity (Ci)	0.00E+00	N/A	0.00E+00	0.00E+00	N/A	N/A	N/A	N/A	N/A
^{243}Am Activity (Ci)	6.07E-02	1.28E-03	5.99E-02	1.56E-03	2.6%	5.908	0.206	0.493	0.648
^{243}Cm Activity (Ci)	2.03E-02	7.72E-04	2.12E-02	6.56E-04	3.1%	0.721	0.396	-1.121	0.464
TRU Alpha Conc. (nCi/g)	4,660	74	4,674	98	2.1%	7.034	0.134	-0.130	0.903

Quantity of Interest	χ^2 Test	*t* Test
^{90}Sr Activity (Ci)	Not Significant	**Highly Significant**
^{137}Cs Activity (Ci)	Not Significant	**Highly Significant**
^{233}U Activity (Ci)	N/A	Not Applicable
^{234}U Activity (Ci)	N/A	Not Applicable
^{235}U Activity (Ci)	N/A	Not Applicable
^{237}Np Activity (Ci)	Not Significant	Not Significant
^{238}Pu Activity (Ci)	N/A	Not Applicable
^{238}U Activity (Ci)	N/A	Not Applicable
^{239}Pu Activity (Ci)	N/A	Not Applicable
^{240}Pu Activity (Ci)	N/A	Not Applicable
^{241}Am Activity (Ci)	Not Significant	Not Significant
^{241}Pu Activity (Ci)	N/A	Not Applicable
^{242}Pu Activity (Ci)	N/A	Not Applicable
^{243}Am Activity (Ci)	Not Significant	Not Significant
^{243}Cm Activity (Ci)	Not Significant	Not Significant
TRU Alpha Conc. (nCi/g)	Not Significant	Not Significant

Instrument: MILCC2
Container: X10C9402644Q

Quantity of Interest	Original Measurement			Replicate #1			Replicate #2		
	Reported Value	Absolute Uncertainty	Relative Uncertainty	Reported Value	Absolute Uncertainty	Relative Uncertainty	Reported Value	Absolute Uncertainty	Relative Uncertainty
^{90}Sr Activity (Ci)	1.22E-01	2.42E-03	2.0%	1.16E-01	2.31E-03	2.0%	1.16E-01	2.30E-03	2.0%
^{137}Cs Activity (Ci)	7.08E-03	1.41E-04	2.0%	6.74E-03	1.34E-04	2.0%	6.72E-03	1.33E-04	2.0%
^{233}U Activity (Ci)	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%
^{234}U Activity (Ci)	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%
^{235}U Activity (Ci)	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%
^{237}Np Activity (Ci)	6.44E-06	1.06E-06	16.5%	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%
^{238}Pu Activity (Ci)	3.46E-03	2.91E-03	84.1%	3.51E-03	2.95E-03	84.0%	3.44E-03	2.90E-03	84.3%
^{238}U Activity (Ci)	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%
^{239}Pu Activity (Ci)	4.27E-06	5.00E-06	117.1%	4.30E-06	5.04E-06	117.1%	4.22E-06	4.93E-06	116.8%
^{240}Pu Activity (Ci)	9.12E-04	6.94E-04	76.1%	9.25E-04	7.03E-04	76.0%	9.06E-04	6.89E-04	76.1%
^{241}Am Activity (Ci)	1.69E-02	5.49E-04	3.2%	1.67E-02	5.41E-04	3.2%	1.67E-02	5.39E-04	3.2%
^{241}Pu Activity (Ci)	2.83E-02	3.43E-02	121.2%	2.86E-02	3.47E-02	121.3%	2.81E-02	3.40E-02	121.0%
^{242}Pu Activity (Ci)	4.66E-05	4.24E-05	91.0%	4.73E-05	4.32E-05	91.3%	4.64E-05	4.24E-05	91.4%
^{243}Am Activity (Ci)	6.38E-04	1.57E-05	2.5%	6.45E-04	1.60E-05	2.5%	6.32E-04	1.55E-05	2.5%
TRU Alpha Conc. (nCi/g)	909	130	14.3%	903	132	14.6%	927	129	13.9%

Quantity of Interest	Replicate #3			Replicate #4			Replicate #5		
	Reported Value	Absolute Uncertainty	Relative Uncertainty	Reported Value	Absolute Uncertainty	Relative Uncertainty	Reported Value	Absolute Uncertainty	Relative Uncertainty
^{90}Sr Activity (Ci)	1.16E-01	2.30E-03	2.0%	1.16E-01	2.30E-03	2.0%	1.16E-01	2.29E-03	2.0%
^{137}Cs Activity (Ci)	6.73E-03	1.34E-04	2.0%	6.72E-03	1.33E-04	2.0%	6.70E-03	1.33E-04	2.0%
^{233}U Activity (Ci)	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%
^{234}U Activity (Ci)	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%
^{235}U Activity (Ci)	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%
^{237}Np Activity (Ci)	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%
^{238}Pu Activity (Ci)	3.43E-03	2.89E-03	84.3%	3.44E-03	2.90E-03	84.3%	3.40E-03	2.86E-03	84.1%
^{238}U Activity (Ci)	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%	0.00E+00	N/A	0.0%
^{239}Pu Activity (Ci)	4.20E-06	4.92E-06	117.1%	4.22E-06	4.94E-06	117.1%	4.17E-06	4.88E-06	117.0%
^{240}Pu Activity (Ci)	9.04E-04	6.87E-04	76.0%	9.07E-04	6.90E-04	76.1%	8.96E-04	6.81E-04	76.0%
^{241}Am Activity (Ci)	1.74E-02	5.64E-04	3.2%	1.73E-02	5.61E-04	3.2%	1.73E-02	5.60E-04	3.2%
^{241}Pu Activity (Ci)	2.80E-02	3.39E-02	121.1%	2.81E-02	3.40E-02	121.0%	2.77E-02	3.36E-02	121.3%
^{242}Pu Activity (Ci)	4.62E-05	4.22E-05	91.3%	4.64E-05	4.24E-05	91.4%	4.58E-05	4.19E-05	91.5%
^{243}Am Activity (Ci)	6.30E-04	1.55E-05	2.5%	6.33E-04	1.55E-05	2.4%	6.25E-04	1.53E-05	2.4%
TRU Alpha Conc. (nCi/g)	926	129	13.9%	923	129	14.0%	918	128	13.9%

Quantity of Interest	Original Measurement		Sample Mean	Sample Standard Deviation	Relative Standard Deviation	χ^2	Pr($x < \|\chi^2\|$)	t	Pr($x < \|t\|$)
	Reported Value	Absolute Uncertainty							
^{90}Sr Activity (Ci)	1.22E-01	2.42E-03	1.16E-01	1.55E-17	0.0%	0.000	1.000	22.033	0.000
^{137}Cs Activity (Ci)	7.08E-03	1.41E-04	6.72E-03	1.48E-05	0.2%	0.044	1.000	22.033	0.000
^{233}U Activity (Ci)	0.00E+00	N/A	0.00E+00	0.00E+00	N/A	N/A	N/A	N/A	N/A
^{234}U Activity (Ci)	0.00E+00	N/A	0.00E+00	0.00E+00	N/A	N/A	N/A	N/A	N/A
^{235}U Activity (Ci)	0.00E+00	N/A	0.00E+00	0.00E+00	N/A	N/A	N/A	N/A	N/A
^{237}Np Activity (Ci)	6.44E-06	1.06E-06	0.00E+00	0.00E+00	N/A	0.000	1.000	N/A	N/A
^{238}Pu Activity (Ci)	3.46E-03	2.91E-03	3.44E-03	4.04E-05	1.2%	0.001	1.000	0.362	0.736
^{238}U Activity (Ci)	0.00E+00	N/A	0.00E+00	0.00E+00	N/A	N/A	N/A	N/A	N/A
^{239}Pu Activity (Ci)	4.27E-06	5.00E-06	4.22E-06	4.82E-08	1.1%	0.000	1.000	0.910	0.414
^{240}Pu Activity (Ci)	9.12E-04	6.94E-04	9.08E-04	1.06E-05	1.2%	0.001	1.000	0.377	0.725
^{241}Am Activity (Ci)	1.69E-02	5.49E-04	1.71E-02	3.49E-04	2.0%	1.619	0.805	-0.470	0.663
^{241}Pu Activity (Ci)	2.83E-02	3.43E-02	2.81E-02	3.24E-04	1.2%	0.000	1.000	0.563	0.603
^{242}Pu Activity (Ci)	4.66E-05	4.24E-05	4.64E-05	5.50E-07	1.2%	0.001	1.000	0.299	0.780
^{243}Am Activity (Ci)	6.38E-04	1.57E-05	6.33E-04	7.38E-06	1.2%	0.885	0.927	0.618	0.570
TRU Alpha Conc. (nCi/g)	909	130	919	10	1.1%	0.023	1.000	-0.967	0.388

Quantity of Interest	χ^2 Test	*t* Test
^{90}Sr Activity (Ci)	Not Significant	**Highly Significant**
^{137}Cs Activity (Ci)	Not Significant	**Highly Significant**
^{233}U Activity (Ci)	N/A	Not Applicable
^{234}U Activity (Ci)	N/A	Not Applicable
^{235}U Activity (Ci)	N/A	Not Applicable
^{237}Np Activity (Ci)	Not Significant	Not Applicable
^{238}Pu Activity (Ci)	Not Significant	Not Significant
^{238}U Activity (Ci)	N/A	Not Applicable
^{239}Pu Activity (Ci)	Not Significant	Not Significant
^{240}Pu Activity (Ci)	Not Significant	Not Significant
^{241}Am Activity (Ci)	Not Significant	Not Significant
^{241}Pu Activity (Ci)	Not Significant	Not Significant
^{242}Pu Activity (Ci)	Not Significant	Not Significant
^{243}Am Activity (Ci)	Not Significant	Not Significant
TRU Alpha Conc. (nCi/g)	Not Significant	Not Significant

ATTACHMENT F: DOSE-TO-CURIE CONTINUED COMPLIANCE INSPECTION CHECKLIST

EPA Inspection No.: CCP-ORNL-CC-2018 **Inspection Date: March 6–8, 2018**

Part 1: Onsite Observation at ORNL Transuranic Waste Processing Center

Observation Date: March 6, 2018

Drum No.: ORRH00963

Waste Stream No: ORREDCRHHET (Post 2014)

BDR No.: ORRHDTC18003

Other Records Examined: CCP-TP-504, Revision 20, February 20, 2018; Operational Logbook for Remote Handled Operations, Control No. CCP-RH-ORNL-DTC-02, February 1, 2018; CCP Operator Aid: OA-ORNL-0160-18, February 1, 2018; LOQI ORNL_2018-3-6_3_00_AM.xlxs

List of FHZ 612 Gamma Probe Nos. with Calibration Dates: XC0894, October 2, 2016; XC0761, September 1, 2017; XC0677, 8-2-2018

List of 4241-L Neutron Probe Nos. with Calibration Dates: XC1002, March 29, 2017; XC1001, February 6, 2018

List of 12-4 Neutron Probe Nos. with Certificate Dates: WIPP191-170417, April 18, 2017; WIPP192, 2-12-2018, WIPP191-180711, July 17, 2018

1) General System Attributes

Technical Element/Aspect	Comments
1-3) Where does ORNL-CP perform DTC? Is this the same location as previously approved by the EPA?	ORNL TWPC, Process Building No.7880, DTC Alcove (Shielded Hot Cell) Same location as previous EPA continued compliance inspection
1-4) Describe any substantive changes to the DTC process, i.e., any significant departures from what the EPA had approved previously.	No changes since addition of neutron-based DTC in CCP-TP-504, Revision 20, February 20, 2018; Revision 18 was current during previous EPA continued compliance inspection
1-5) Is the DTC demonstration gamma-based only, or does it include neutron-based DTC?	The EPA observed ORNL-CCP personnel execute gamma and neutron DTC on the same container.
1-6) Is there an ORNL-CCP-issued logbook to formally document DTC operations? If so, identify the logbook.	Yes, Operational Logbook for Remote Handled Operations, Control No. CCP-RH-ORNL-DTC-02

2) DTC Measurement Startup

Technical Element/Aspect	Yes, No, NA	Comments
2-1) Identify the DTC Operator(s).	Yes	DTC Operator was Ron Whitson
2-2) Does the DTC Operator have the appropriate current training, i.e., listed on the appropriate LOQI?	Yes	DTC Operator (Ron Whitson), Chad Gerlock (ITR) and Ryan Martin (SPM) were all appropriately trained and listed on the 3-6-2018 ORNL-CCP LOQI
2-3) Did the DTC Operator verify the current revision of the DTC procedure prior to beginning DTC?	Yes	CCP-TP-504, Revision 20; Operational Logbook for Remote Handled Operations, Control No. CCP-RH-ORNL-DTC-02, page 5, March 6, 2018
2-4) Did the DTC Operator verify the software version prior to beginning DTC?	Yes	Operational Logbook for Remote Handled Operations, Control No. CCP-RH-ORNL-DTC-02, page 5, March 6, 2018; Post-2014 DTC Spreadsheet.xlsx, Revision 1, Addendum 1, SCO 1239 per ORNL_SIL_3-5-2018
2-5) Are there operator aids posted that are relevant to DTC? If so, list them.	Yes	CCP Operator Aid: OA-ORNL-0160-18, February 1, 2018
2-6) Did the DTC Operator record the waste container no. and waste stream for each container measured?	Yes	Operational Logbook for Remote Handled Operations, Control No. CCP-RH-ORNL-DTC-02, page 5, March 6, 2018; Container No. ORRH00963; Waste Stream: ORREDCRHHET (Post 2014)
2-7) Did the DTC Operator specify the container measurement configuration?	Yes	55-gallon drum; CCP Operator Aid: OA-ORNL-0160-18, February 1, 2018
2-8) Did DTC Operator take background measurements taken prior to beginning DTC operations?	Yes	CCP-TP-504, Revision 20, Attachment 1 – Measurement Control Report, March 6, 2018, part of DTC BDR ORRHDTC18003
2-9) Are the background measurements acceptable?	Yes	CCP-TP-504, Revision 20, Attachment 1 – Measurement Control Report, March 6, 2018, part of DTC BDR ORRHDTC18003
2-10) Did the DTC Operator weigh the drum prior to measurement?	Yes	Scale ID: WIPP193; Operational Logbook for Remote Handled Operations, Control No. CCP-RH-ORNL-DTC-02, page 5, March 6, 2018
2-11) Did the DTC Operator perform an acceptable scale check prior to measurement?	Yes	Operational Logbook for Remote Handled Operations, Control No. CCP-RH-ORNL-DTC-02, page 5, March 6, 2018; Scale Tolerance is ± 1 kg
2-12) Did the scale have a current calibration?	Yes	Calibration due date: 4-24-2018; CCP Operator Aid: OA-ORNL-0160-18, February 1, 2018

Technical Element/Aspect	Yes, No, NA	Comments
2-13) Did the DTC Operator take appropriate neutron and/or gamma instrument performance checks prior to beginning DTC operations?	Yes	Gamma and neutron; CCP-TP-504, Revision 20, Attachment 1 – Measurement Control Report, March 6, 2018, part of DTC BDR ORRHDTC18003
2-14) Are the performance checks technically adequate?	Yes	Gamma and neutron; CCP-TP-504, Revision 20, Attachment 1 – Measurement Control Report, March 6, 2018, part of DTC BDR ORRHDTC18003
2-15) Did the DTC Operator use traceable gamma and/or neutron radionuclide sources for instrument calibration checks? List or reference all standards used.	Yes	Gamma and neutron; CCP Operator Aid: OA-ORNL-0160-18, February 1, 2018; CCP-TP-504, Revision 20, Attachment 1 – Measurement Control Report, March 6, 2018; Calibration Certificate from Thermo Fisher Scientific for Gamma Probe Nos. XC0894, XC0761 and XC0677, and Display No. 02553; Oak Ridge National Laboratory Radiation Standards and Calibration Laboratory for Neutron Probe Nos. XC1002, WIPP191 and WIPP192 and Display Nos. 323695 and 290883
2-16) Were the gamma and neutron meter and probes identified and appropriately calibrated?	Yes	Gamma and neutron; CCP Operator Aid: OA-ORNL-0160-18, February 1, 2018; CCP-TP-504, Revision 20, Attachment 1 – Measurement Control Report, March 6, 2018
2-17) Did the DTC Operator check and record the instrument calibration checks prior to beginning DTC?	Yes	Operational Logbook for Remote Handled Operations, Control No. CCP-RH-ORNL-DTC-02, page 5, March 6, 2018; CCP Operator Aid: OA-ORNL-0160-18, February 1, 2018

3) DTC Performance & Measurement Control

Technical Element/Aspect	Yes, No, NA	Comments
3-1) Did the DTC Operator take four measurements for each drum, i.e., at 0°, 90°, 180° and 270°?	Yes	CCP-TP-504, Revision 20, Attachment 2 – Container Data Sheet; Gamma: 15.7, 15.4, 16.9 & 16.7 mR/hr; Neutron: 76, 76, 80 & 78 mrem/hr, part of DTC BDR ORRHDTC18003
3-2) Are all dose rate measurements at least three times greater than the background measurement?	Yes	CCP-TP-504, Revision 20, Attachment 2 – Container Data Sheet, and Attachment 10 – Duplicate Container Data Sheet, March 6, 2018, part of DTC BDR ORRHDTC18003

Technical Element/Aspect	Yes, No, NA	Comments
3-3) Did the DTC Operator perform a replicate scan for the DTC batch?	Yes	Drum No. ORRH00963; CCP-TP-504, Revision 20, Attachment 10 – Duplicate Container Data Sheet, March 6, 2018, part of DTC BDR ORRHDTC18003
3-4) Did the replicate scan meet the acceptance criteria of RPD ≤ 40%?	Yes	CCP-TP-504, Revision 20, Attachment 2 – Container Data Sheet, and Attachment 10 – Duplicate Container Data Sheet, March 6, 2018; Relative Percent Difference Spreadsheet SCO 1154 RPD xlxs version 1, addendum 2, Windows 7, 10 and Excel 2010, 2013, 2016 – Minor change 3-01-18; RPD Values: Gamma - 0.46, Neutron - 1.60, part of DTC BDR ORRHDTC18003

Part 2: Review of DTC Records

DTC BDR Nos.: ORRHDTC17011, ORRHDTC17014, ORRHDTC17016 ORRHDTC18001

Other Records Examined: ORNL RH ORNL AK Tracking Spreadsheet, 2-7-2018_10_11_19AM.xlxs; LOQI – ORNL_2017-7-27_3_00_AM.xlxs; ORNL_2017-10-26_3_00_AM.xlxs, ORNL_2017-10-27_3_00_AM.xlxs, ORNL_2017-12-5_3_00_AM.xlxs, ORNL_2018-1-10_3_00_AM.xlxs, ORNL_2018-1-11_3_00_AM.xlxs; TRU Waste Processing Center, Preparation of Calculations, CM-P-EG-006/Revision 1, Calculation No.: RH-FW-C-RP-OO6, Revision 2, February 16, 2009; RH Drum Contact Dose Rate from 1-meter Measurements, Scott A. Byers

4) Scaling Factor & TMU Determinations

Technical Element/Aspect	Yes, No, NA	Comments
4-1) Has ORNL-CCP appropriately correlated scaling factors and the derivation of TMU with specific waste groupings (i.e., cask number) and controlled their application by using the appropriate DTC spreadsheet?	Yes	All DTC BDRs used the DTC spreadsheet version that was appropriate for the waste containers that were assayed.

5) RH Determination

Technical Element/Aspect	Yes, No, NA	Comments
5-1) Does ORNL-CCP use gamma and/or neutron DTC values for the container's RH determination?	Yes	Gama and neutron values from DTC supports ORNL-CCPs determination of a drum's RH status.

Technical Element/Aspect	Yes, No, NA	Comments
5-2) Is there technical documentation supporting converting 1-meter dose rate to contact dose-rate?	Yes	Conversion factors are provided for gamma and neutron dose rates.

6) Training and Data Reporting

Technical Element/Aspect	Yes, No, NA	Comments
6-1) Do all ORNL-CCP DTC operators have current CCP training as verified on an LOQI?	Yes	LOQI listed above
6-2) Has ORNL-CCP adequately addressed any NCRs related to DTC since the last EPA continued compliance inspection?	NA	The only DTC NCRs that ORNL-CCP initiated addressed containers whose sum of fractions for the gamma and neutron source term exceeded criterion, and the containers were rejected. There were no other DTC-related NCRs.
6-3) Do appropriately qualified personnel review and approve DTC data?	Yes	LOQI listed above

Technical Element/Aspect	Yes, No, NA	Comments
6-4) Do the DTC BDRs contain: • Testing facility name, testing batch number, container numbers, and signature of the SPM or designee • Table of contents • Background and performance check data or control charts for the relevant time period • Separate waste container dose-to-curie conversion records for each container • Waste stream designation • Scale identification and check verification • Drum net weight • Date of DTC • Identification of gamma/neutron instruments and reference source values • Gamma/neutron instrument checks for appropriate ranges • Correct revision of CCP-TP-504 • Cask number and scaling factor spreadsheet reference • One duplicate container per BDR showing RPD ≤40% • Gamma and neutron backgrounds • Copies of all relevant NCRs	Yes	DTC BDRs listed above
6-5) Do the waste container dose-to-curie conversion records include: • Method/procedure used • Date of radioassay • Listing of four gamma and/or neutron 1-meter dose rates at 0°, 90°, 180° and 270° • Activities and associated TMU for individual radionuclides • TRU alpha concentration and its associated TMU • Decay heat and plutonium equivalent curies • Fissile gram equivalent (FGE) • Operator and reviewer signatures	Yes	DTC BDRs listed above

ATTACHMENT G: REAL-TIME RADIOGRAPHY CONTINUED COMPLIANCE INSPECTION CHECKLIST

EPA Inspection No.: CCP-ORNL-CC-2018 **Inspection Date: March 6–8, 2018**

1) Real-Time Radiography Process

Technical Element or Aspect	Yes, No or NA	Comments and Objective Evidence
1-1) Do ORNL-CCP procedures provide complete instructions for operators to perform the RTR examination and complete associated documentation?	Yes	ORNL-CCP RTR Operator adequately explained the process for examining NFS54100 soil Drum No. ORNFS57932825 using RTR and entering data electronically. RTR BDR No. OR-RTR6-0874 (Draft) Audio/visual recordings for selected containers from BDR Nos. OR-RTR6-0771, OR-RTR6-0773 and OR-RTR6-0777 Operational Log Book CCP-CH-ORNL-RTR-UNIT 6-02-2018, pages 43 & 44 CCP-TP-053, CCP CH Standard Real-Time Radiography Inspection Procedure, Revision 16 CCP-TP-165, Revision 3 CCP-TP-068, Revision 12
1-2) Do ORNL-CCP RTR procedures require an image quality check to be performed?	Yes	ORNL-CCP RTR Operator adequately explained how the acceptability of an image is determined and performed and documented an image quality check prior to beginning RTR. Observation of RTR on Drum No. ORNFS57932825 Operational Log Book CCP-CH-ORNL-RTR-UNIT 6-02-2018, pages 43 & 44 CCP-TP-053, CCP CH Standard Real-Time Radiography Inspection Procedure, Revision 16 RTR BDR No. OR-RTR6-0874 (Draft) Audio/visual recordings for selected containers from BDR Nos. OR-RTR6-0771, OR-RTR6-0773 and OR-RTR6-0777

Technical Element or Aspect	Yes, No or NA	Comments and Objective Evidence
1-3) Does the ORNL-CCP RTR procedure allow the operator to adjust the RTR to accommodate the physical properties of the waste and waste containers likely to be encountered at the site?	Yes	ORNL-CP RTR Operator could identify applicable policies and procedures governing the operation of RTR equipment and demonstrated how to adjust the system to address materials of varying densities, i.e., higher density material was examined with the maximum x-ray voltage and low-density material at a lower x-ray voltage. Operator adequately explained what is done if an image is unacceptable, as in solidified or lead-lined wastes. Drum that the EPA observed during inspection was an SCG S4000 (soils) and did not require system adjustment for varying densities. RTR BDR No. OR-RTR6-0874 (Draft) Audio/visual recording No. OR-RT6-0874 RTR BRD Nos. OR-RTR6-0771, OR-RTR6-07713 and OR-RTR6-0777 Audio/visual recordings for selected containers from BDR Nos. OR-RTR6-0771, OR-RTR6-0773 and OR-RTR6-0777 CCP-TP-053, CCP CH Standard Real-Time Radiography Inspection Procedure, Revision 16 CCP-TP-165, Revision 3 CCP-TP-068, Revision 12
1-4) There is a procedure for determining whether the waste matches the waste stream description and waste matrix code, and for determining waste material parameters and weights.	Yes	The EPA observed implementation of RTR procedure and determined it was adequate. The ORNL-CCP RTR Operator verified that the container's waste matched the waste stream description and WMC. RTR Operator demonstrated how WMP weights are estimated by compiling an inventory of waste items and the residual or packaging materials. Drum that the EPA observed during inspection was an SCG S4000 (soils) and did not require determination of WMP weights. Operational Log Book CCP-CH-ORNL-RTR-UNIT 6-02-2018, pages 43 & 44 RTR BDR No. OR-RTR6-0874 (Draft) RTR BRD Nos. OR-RTR6-0771, OR-RTR6-0773 and OR-RTR6-0777 Audio/visual recordings for selected containers from BDR Nos. OR-RTR6-0771, OR-RTR6-0773 and OR-RTR6-0777 CCP-TP-053, CCP CH Standard Real-Time Radiography Inspection Procedure, Revision 16 CCP-TP-165, Revision 3 CCP-TP-068, Revision 12

Technical Element or Aspect	Yes, No or NA	Comments and Objective Evidence
1-5) The RTR procedure provides instructions for identifying prohibited items and for processing drums containing prohibited items.	Yes	ORNL-CCP RTR Operator named prohibited items and adequately explain how to determine the presence of prohibited liquids and provided an adequate explanation of required actions if prohibited items were encountered, consistent with RTR procedure. Drum that the EPA observed during inspection was an SCG S4000 (soils) and did not contain any prohibited items. RTR BDR No. OR-RTR6-0713 RTR BRD Nos. OR-RTR6-0771, OR-RTR6-0773 and OR-RTR6-0777 Audio/visual recordings for selected containers from BDR Nos. OR-RTR6-0771, OR-RTR6-0773 and OR-RTR6-0777 CCP-TP-053, CCP CH Standard Real-Time Radiography Inspection Procedure, Revision 16
1-6) RTR procedures include the required quality control examinations, evaluation accuracy and reproducibility of the RTR process.	Yes	The EPA observed that an independent replicate scan is performed on one waste container per day or on one container per testing batch (whichever is less frequent). An independent observation of one scan is performed by a qualified ORNL-CP RTR Operator other than the initial RTR Operator. RTR BDR No. OR-RTR6-0874 (Draft) Operational Log Book CCP-CH-ORNL-RTR-UNIT 6-02-2018, pages 43 & 44 RTR BRD Nos. OR-RTR6-0771, OR-RTR6-07713 and OR-RTR6-0777 Audio/visual recordings for selected containers from BDR Nos. OR-RTR6-0771, OR-RTR6-0773 and OR-RTR6-0777 CCP-TP-053, CCP CH Standard Real-Time Radiography Inspection Procedure, Revision 16

2) Real-Time Radiography Process

Technical Element or Aspect	Yes, No or NA	Comments and Objective Evidence
2-1) Are RTR records of sufficient quality for a complete review?	Yes	The RTR audio/visual sound track is audible, and all required information is contained on the audible portion. The audio/visual portion is consistent with the hard copy data package for the same drum. RTR BDR No. OR-RTR6-0874 (Draft) RTR BRD Nos. OR-RTR6-0771, OR-RTR6-0773 and OR-RTR6-0777 Audio/visual recordings for selected containers from BDR Nos. OR-RTR6-0771, OR-RTR6-0773 and OR-RTR6-0777 CCP-TP-053, CCP CH Standard Real-Time Radiography Inspection Procedure, Revision 16

Technical Element or Aspect	Yes, No or NA	Comments and Objective Evidence
2-2) Procedures contain standardized forms for recording RTR data.	Yes	ORNL-CP RTR Operator adequately explained the process for entering all data from the drum examination using an electronic format. RTR procedure incorporates the use of standardized forms, and the EPA observed the ORNL-CP RTR Operator entering data directly into an electronic form by computer while in the RTR trailer. RTR BDR No. OR-RTR6-0874 (Draft) RTR BRD Nos. OR-RTR6-0771, OR-RTR6-07713 and OR-RTR6-0777 Audio/visual recordings for selected containers from BDR Nos. OR-RTR6-0771, OR-RTR6-0773 and OR-RTR6-0777 CCP-TP-053, CCP CH Standard Real-Time Radiography Inspection Procedure, Revision 16
2-3) Do ORNL-CCP procedures require review of BDRs at the data generation and project level?	Yes	Data-generation (ITR) and project-level (SPM) reviews for ORNL-CCP RTR BDRs are performed and documented. RTR BDR No. OR-RTR6-0874 (Draft) RTR BRD Nos. OR-RTR6-0771, OR-RTR6-07713 and OR-RTR6-0777 Audio/visual recordings for selected containers from BDR Nos. OR-RTR6-0771, OR-RTR6-0773 and OR-RTR6-0777 CCP-TP-053, CCP CH Standard Real-Time Radiography Inspection Procedure, Revision 16

3) Personnel Training

Technical Element or Aspect	Yes, No or NA	Comments and Objective Evidence
3-1) Do ORNL-CCP procedures identify required training and qualifications for RTR personnel?	Yes	RTR operators must complete RTR examination of a training container and meet 100% of the DQOs: identification of prohibited items, excess liquids, verification of physical form and waste stream description, assigning waste to WMPs and estimation of WMP weights. RTR training includes AK. Training containers will be representative of wastes expected at each TRU generator site and SME must be present for the RTR Operator's scan of training container. RTR Operator requalification is required every two years and includes an eye examination, the successful examination of a training container and passing a comprehensive written test based on training objectives with a minimum score of 80%. Inventory sheets for RTR containers NDE-TEST-68 and NDE-TEST-74 Training container evaluation data sheets for RTR Operators Aaron Elliot, Thaddeus Hasselstrom, Tony Johnson, Eric Lyles, Fred Oney and Dale Simpson Qualification Cards for RTR Operators Aaron Elliot, Thaddeus Hasselstrom, Tony Johnson, Eric Lyles, Fred Oney and Dale Simpson American Society for Nondestructive Testing, Recommended Practices, No. SNT-TC-1A, June 1980 Edition

ATTACHMENT H: VISUAL EXAMINATION FOR CONTACT-HANDLED WASTE CONTINUED COMPLIANCE CHECKLIST

EPA Inspection No.: CCP-ORNL-CC-2018 **Inspection Date: March 6–8, 2018**

1) Visual Examination Process

Technical Element or Aspect	Yes, No or NA	Comments and Objective Evidence
1-1) Do ORNL-CCP procedures and technical guidance documents provide complete instructions for performing CH VE?	Yes	The EPA observed the VE event for SCG S5400 Container No. X10C9312233-A1 (output container X10C0402896F1) from Waste Stream OR-ISTP-CH-HET, covered by CCP-AK-10, Revision 0. This container had previously undergone RTR (BDR No. OR-RTR6-0749) earlier in 2016 and was rejected due to the presence of impenetrable items. Two ORNL-CCP Operators performed VE in accordance with CCP-TP-113, Revision 21, and recorded all required data, verified the waste stream description and WMC and confirmed the presence/absence of prohibited items. VE Operators identified several pieces of impenetrable metals, as indicated by RTR NCR No. NCR-ORNL-0078-17, Revision 0 Completed Attachment 2, CCP Waste Visual Examination Data Form, for Container No. X10C9311083-A1. Qualification Cards for Gilbert Gutierrez and Anthony Harley performing VE. Qualification Cards for VEEs Derek Matheny, Anthony Harley, Tommy Mojica and Pat Tilmon VEE appointment letters for VEEs Derek Matheny, Anthony Harley, Tommy Mojica and Pat Tilmon List of Applicable Waste Streams Qualified for VEE LOQI Excel spreadsheets for VE personnel for calendar years 2017 and 2018 CCP-TP-113, CCP Standard Contact-Handled Waste Visual Examination, Revision 21 CCP-QP-002, CCP Training and Qualification Plan, Revision 44 CH VE BDR No. ORVECH0190
1-2) Are corrective actions taken and appropriately documented and closed when necessary?	Yes	There were limited CH VE-related ORNL-CCP NCRs to review due to the small number of containers undergoing CH VE. ORNL-CCP has been processing containers that are predominantly SCG S4000 (soils), a matrix for which the rejection rate is expected to be low. The EPA did review RTR-related NCR Nos. NCR-ORNL-0329-16, Revision 1, and NCR-ORNL-0078-17, Revision 1. NCR-ORNL-00329-16 had been initiated, processed and closed appropriately. NCR-ORNL-0078-17 documented the RTR event that rejected the container due to the presence of impenetrable items, which then necessitated this VE event. ORNL-CCP provided adequate documentation to cover all aspects of the NCR process for this container. ORNL-CCP CH VE Operators were able to describe how they initiate a corrective action. RTR NCR Nos.NCR-ORNL-0329-16, Revision 1; NCR-ORNL-0078-17, Revision 1

Technical Element or Aspect	Yes, No or NA	Comments and Objective Evidence
1-3) Do ORNL-CCP procedure(s) require data-generation and project-level reviews of BDRs?	Yes	The EPA verified that reviews were performed for CH VE BDR No. ORVECH0190 that contained one CH drum, No. X10C9312233A1. The ITR (Attachment 3) and SPM (Attachment 1) reviews had been completed and signed by Chuck Wallace and Gilbert Gutierrez. Because this container had not been promoted though Project level Validation, the Draft BDR did not contain a Completed Attachment. 1, from CCP-TP-001, Revision 21, CCP Project Level Data Validation and Verification Checklist and Summary Completed Attachments 1 – 3 from CCP-TP-113, Revision 21, Contact-Handled Waste Visual Examination; CCP Waste Visual Examination Data Form, for container No. X10C9312233A1 BDR No. ORVECH0190 (Draft)

2) Visual Examination Records

Technical Element or Aspect	Yes, No or NA	Comments and Objective Evidence
2-1) Are all appropriate CH VE records available for review?	Yes	ORNL-CCP provided all documents and records requested by the EPA. Lifetime/QA records are Attachments 1–5, Copy of NCRs; QA/nonpermanent records are DVD Completed Attachment 2, CCP Waste Visual Examination Data Form, for Container No. X10C93112233A from BDR No. ORVECH0190 (Draft) Qualification Cards for VEEs Derek Matheny, Anthony Harley, Tommy Mojica and Pat Tilmon VEE appointment letters for Derek Matheny, Anthony Harley, Tommy Mojica and Pat Tilmon LOQI for VE personnel CCP-QP-002, CCP Training and Qualification Plan, Revision 44

3) Personnel Training

Technical Element or Aspect	Yes, No or NA	Comments and Objective Evidence
3-1) Do ORNL-CCP procedures identify required training and qualifications for CH VE personnel?	Yes	ORNL-CCP CH VE training includes examination, OJT (identification of summary category groups, WMPs, packaging configurations, residual liquids) and formal training (project requirements, container identification and labeling, applicable state and federal regulations). Qualification Cards for VE Operators Gilbert Gutierrez, Anthony Harley, Derek Matheny, and Pat Tilmon VEE appointment letters for Derek Matheny, Anthony Harley, Tommy Mojica and Pat Tilmon LOQI for VE personnel VE Operators: Gilbert Gutierrez, Anthony Harley, Derek Matheny and Pat Tilmon VEEs: Derek Matheny, Anthony Harley, Tommy Mojica and Pat Tilmon

Technical Element or Aspect	Yes, No or NA	Comments and Objective Evidence
3-2) Are the CH VE Operator's qualification and requalification requirements described?	Yes	The EPA reviewed the qualification cards for several CH VE Operators and determined that they were appropriately trained and that their training records were complete. To become qualified, the CH VE Operator must pass a comprehensive written test with an 80% or better grade; test includes VE operations, documentation, characterization, formal training elements and procedural elements. VE Operators must demonstrate capability in the presence of the VEE during OJT. However, the formal and OJT training is conducted by a qualified SME. Qualification Cards for VE Operators Gilbert Gutierrez, Anthony Harley, Derek Matheny and Pat Tilmon VEE appointment letters for Derek Matheny, Anthony Harley, Tommy Mojica and Pat Tilmon LOQI for VE personnel
3-3) Does ORNL-CCP have a designated VEE for CH VE?	Yes	ORNL-CCP CH VEEs are on site but are not necessarily present for all CH VE events. VEE designations are documented by letter. VEEs (1) are knowledgeable with regard to the VE processes, specific waste streams examined and the CH TRU waste being characterized on site in general and (2) are responsible for overall direction and implementation of VE at the TWPC. The Certification Plan specifies the selection, qualification and training requirements of VEEs. Qualification Cards for VEEs Derek Matheny, Anthony Harley, Tommy Mojica and Pat Tilmon VEE appointment letters for Derek Matheny, Anthony Harley, Tommy Mojica and Pat Tilmon LOQI for VE personnel CCP-QP-002, CCP Training and Qualification Plan, Revision 44

ATTACHMENT I: VISUAL EXAMINATION FOR REMOTE-HANDLED WASTE CONTINUED COMPLIANCE CHECKLIST

EPA Inspection No.: CCP-ORNL-CC-2018 **Inspection Date: March 6–8, 2018**

1) Visual Examination Process

Technical Element or Aspect	Yes, No or NA	Comments and Objective Evidence
1-1) Do ORNL-CCP procedures and technical guidance documents provide complete instructions for performing RH VE?	Yes	The EPA observed the VE process on material originating in Cask No. X10C0701297 from Waste Stream OR-REDC-RH-HET, the report for which will be included in VE BDR No. ORRH00801. Host Site VE Operators were Caleb Dryman and Logan Dean; ORNL-CCP VE Operators were Anthony Harley and Gilbert Gutierrez. The EPA observed the waste stream description, verification of WMC and confirmation regarding the presence/absence of prohibited items. ORNL-CCP VE Operators recorded all pertinent information on the appropriate forms from CCP-TP-500, Revision 16 (Attachments 1, 2 & 4)
1-2) Are corrective actions taken and appropriately documented and closed when necessary?	Yes	There were no RH VE-related ORNL-CCP NCRs to review. The EPA interviewed the RH VE operators Anthony Harley and Gilbert Gutierrez, who were able to describe how to initiate a corrective action. Qualification cards for RH VE Operators Derek Matheny, Spencer Pattee, Tommy Mojica, Perrie Sands, Shawn Treadway, Gilbert Gutierrez, David Lawrence, Anthony Harley and Pat Tilmon CCP-QP-002, CCP Training and Qualification Plan, Revision 44 CCP-TP-500, CCP Remote-Handled Waste Visual Examination, Revision 16
1-3) Do ORNL-CCP procedure(s) require data-generation and project-level reviews of BDRs?	Yes	ORNL-CCP RH VE BDRs have data-generation level reviews signed by the ITRs Gilbert Gutierrez, Chuck Wallace and Shawn Treadway and project-level reviews signed by the SPM Ryan Martin. RH VE BDR Nos. ORNLRHVE17038, ORNLRHVE17053 and ORNLRHVE17064, ITR review from CCP-TP-500, Attachment 2, and SPM review CCP-TP-500, Attachment 3

2) Visual Examination Records

Technical Element or Aspect	Yes, No or NA	Comments and Objective Evidence
2-1) Are all appropriate RH VE records available for review?	Yes	ORNL-CCP made all pertinent records available to the EPA for this inspection. Qualification cards and training packages for RH VE Operators Derek Matheny, Spencer Pattee, Tommy Mojica, Perrie Sands, Shawn Treadway, Gilbert Gutierrez, David Lawrence, Anthony Harley and Pat Tilmon VEE appointment letter for Anthony Harley, Derek Matheny, Tommy Mojica and Pat Tilmon RH VE BDR Nos. ORNLRHVE16023 and ORNLRHVE16046 CCP-QP-002, CCP Training and Qualification Plan, Revision 44 CCP-TP-500, CCP Remote-Handled Waste Visual Examination, Revision 16 Lifetime/QA records – Attachments 1–5, Copy of NCRs; QA/nonpermanent records – DVD (primary and backup)

3) Personnel Training

Technical Element or Aspect	Yes, No or NA	Comments and Objective Evidence
3-1) Do ORNL-CCP procedures identify required training and qualifications for RH VE personnel?	Yes	Qualification cards for RH VE Operators and VEEs Derek Matheny and Pat Tilmon VEE appointment letter for Derek Matheny (6-23-2015) and Pat Tilmon (4-6-2015) RH VE BDR Nos. ORNLRHVE16023 and ORNLRHVE16046 CCP-QP-002, CCP Training and Qualification Plan, Revision 44 CCP-TP-500, CCP Remote-Handled Waste Visual Examination, Revision 16 Lifetime/QA records – Attachments 1–5, Copy of NCRs; QA/nonpermanent records – DVD (primary and backup)

Technical Element or Aspect	Yes, No or NA	Comments and Objective Evidence
3-2) Are the RH VE Operator's qualification and requalification requirements described?	Yes	The ORNL-CCP training program for RH VE personnel includes examination, OJT (identification of summary category groups, WMPs, packaging configurations, residual liquids) and formal training (project requirements, container identification and labeling, applicable state and federal regulations). To become qualified, an RH VE Operator must pass a comprehensive written test with an 80% or better grade that addresses RH VE operations, documentation, characterization, formal training elements and procedural elements. ORNL-CCP RH VE Operators must demonstrate capability in the presence of the VEE during OJT, and the formal training and OJT is conducted by a qualified SME. ORNL-CCP provided acceptable training records for nine RH VE Operators: Derek Matheny, Danielle Lloyd, Spencer Pattee, Pat Tilmon, Anthony Harley and Tommy Mojica, Perrie Sands, Shawn Treadway and Chuck Wallace. LOQI Excel spreadsheets for RH VE personnel for calendar years 2017 and 2018 Qualification cards and training packages for RH VE Operators Derek Matheny, Spencer Pattee, Tommy Mojica, Perrie Sands, Shawn Treadway, Gilbert Gutierrez, David Lawrence, Anthony Harley and Pat Tilmon VEE appointment letter for Anthony Harley, Derek Matheny, Tommy Mojica and Pat Tilmon CCP-QP-002, CCP Training and Qualification Plan, Revision 44
3-3) Does ORNL-CCP have a designated VEE for RH VE?	Yes	ORNL-CCP has four qualified RH VEEs, Anthony Harley, Derek Matheny, Tommy Mojica and Pat Tilmon, all of whom had formal appointment letters, as required. VEE appointment letters for Derek Matheny, Pat Tilmon, Anthony Harley and Tommy Mojica RH ORNL NDE Personnel Waste Stream Qualified Individuals CCP-QP-002, CCP Training and Qualification Plan, Revision 44

ATTACHMENT J: LIST OF DOCUMENTS REVIEWED FOR THIS INSPECTION

AK

AKA001, Acceptable Knowledge Assessment (AKA) for Waste Stream OR-NFS-CH-SOIL, Jeff Harrison, Revision 0, April 12, 2016, with Addendum 1, February 27, 2018

AKA002, Acceptable Knowledge Assessment of the Oak Ridge National Laboratory (ORNL) Radiochemical Engineering Development Center (REDC) Waste Stream OR-REDC-CH-HET, Jeff Harrison, Revision 0, September 14, 2017

AKA003, Acceptable Knowledge Assessment of Nuclear Fuel Services Heterogeneous Debris Waste Stored at Oak Ridge National Laboratory, Waste Stream OR-NFS-CH-HET-A, Jeff Harrison, Revision 0, December 14, 2017

AKE and SPM Acknowledgement of receipt of CCP-QP-002, Revision 44; CCP-QP-005, Revision 25; CCP-TP-002, Revision 27; CCP-TP-005, Revision 29; and CCP-TP-200, Revision 3

AKE Qualification Card for Jeff Harrison, October 6, 2016

AKE Qualification Card for John Kleckner, October 25, 2016

AKE Qualification Card for Ryan Riordan, October 27, 2016

AKE Qualification Card for Sherrod Reavis, October 27, 2016

AKE Qualification Card for Travis Smith, October 25, 2016

BOK001, Memo from Trey Greenwood to Daniel Wade, re: Basis of Knowledge Evaluation for Waste Stream OR-NFS-CH-SOIL, Trey Greenwood, May 9, 2017

C174, E-mail from Don Coffey, Subject: 7920 TRU Waste (REDC Timeline), Don Coffey, et al., March 6, 2013, to December 3, 2014

C182, Compilation of e-mails between Jimmy Selph and Jeff Harrison, re: X10C0800155 and X10C1200372, Jimmy Selph, et al, January 17, 2017 to January 19, 2017

C238, Memo from J. Vance to Irene Quintana, re: ORNL REDC Post-2007 Radionuclide Distributions for CH Waste, J. Vance, March 30, 2016

C239, E-Mails between Jeff Harrison and Tim Hayes, re: pH and Moisture Content of Soil, Tim Hayes and Jeff Harrison, April 12, 2016, to April 17, 2016

CCE001, Chemical Compatibility Evaluation for Waste Stream OR-NFS-CH-SOIL, Jeff Harrison, Revision 0, November 16, 2016

CCE008, Chemical Compatibility Evaluation for Waste Streams OR-REDC-CH-HET and OR-REDC-RH-HET Waste Containers Repackaged at the Transuranic Waste Processing Center (TWPC), Kevin Peters, CCE008, Revision 0, March 20, 2018

CCP-AK-ORNL-001, Central Characterization Program Acceptable Knowledge Summary Report for Nuclear Fuel Services Contact-Handled Transuranic Waste Stored at Oak Ridge National Laboratory, Waste Streams: OR-NFS-CH-HET-A, OR-NFS-CH-SOIL, OR-NFS-CH-HOM-A, Revision 11, July 20, 2017

CCP-AK-ORNL-002, Central Characterization Program Acceptable Knowledge Summary Report for Oak Ridge National Laboratory Radiochemical Engineering Development Center Contact-Handled Transuranic Waste, Waste Stream: OR-REDC-CH-HET, Revision 5, April 4, 2017

CCP-AK-ORNL-005, Central Characterization Program Acceptable Knowledge Summary Report for Oak Ridge National Laboratory Contact-Handled Transuranic Waste from Analytical Chemistry Laboratory Operations, Waste Stream: OR-CHEM-CH-HET, Revision 3, January 14, 2016

CCP-AK-ORNL-013, Central Characterization Program Acceptable Knowledge Summary Report for Oak Ridge National Laboratory Contact-Handled Transuranic Waste from the Curium Recovery Facility, Waste Stream: OR-CRF-CH-HET, Revision 0, May 4, 2016

CCP-AK-ORNL-500, Central Characterization Program Acceptable Knowledge Summary Report for Oak Ridge National Laboratory Radiochemical Engineering Development Center Remote-Handled Transuranic Waste, Waste Stream: OR-REDC-RH-HET, Revision 6, September 8, 2016, Revision 7 Draft B, undated

CCP-AK-ORNL-501, Central Characterization Project, Remote-Handled Transuranic Radiological Characterization, Technical Report for Remote-Handled Transuranic Waste from Oak Ridge National Laboratory Radiochemical Engineering Development Center, Waste Stream: OR-REDC-RH-HET, Revision 6, August 17, 2017

CCP-AK-ORNL-502, Central Characterization Program RH TRU Certification Plan for 40 CFR Part 194 Compliance for ORNL REDC RH Waste, Waste Stream: OR-REDC-RH-HET, Revision 5, February 6, 2014

CCP-TP-002, Revision 20, CCP Reconciliation of DQOs and Reporting Characterization Data, Attachment 2 – CCP Waste Stream Profile Form, OR-REDC-CH-HET, April 20, 2009

CCP-TP-002, Revision 26, CCP Reconciliation of DQOs and Reporting Characterization Data, Attachment 2 – CCP Waste Stream Profile Form, OR-NFS-CH-SOIL, Revision 1, July 27, 2017

CCP-TP-005, Revision 26, CCP Acceptable Knowledge Documentation, Attachment 14 – CCP Acceptable Knowledge Accuracy Report, OR-REDC-CH-HET, No New Lots, February 28, 2018, with memorandum and other attachments

CCP-TP-005, Revision 26, CCP Acceptable Knowledge Documentation, Attachment 15 – CCP TRU Waste Correlation and Surrogate Form, OR-REDC-RH-HET, November 26, 2013

CCP-TP-005, Revision 27, CCP Acceptable Knowledge Documentation, Attachment 8 – Waste Containers List, OR-CHEM-CH-HET, January 20, 2016

CCP-TP-005, Revision 28, CCP Acceptable Knowledge Documentation, Attachment 13 – CCP Waste Stream Characterization Checklist, OR-NFS-CH-HET-A, Lot 25, March 24, 2016

CCP-TP-005, Revision 28, CCP Acceptable Knowledge Documentation, Attachment 13 – CCP Waste Stream Characterization Checklist, OR-REDC-CH-HET, Lots 78–79, April 26, 2016, and May 26, 2016

CCP-TP-005, Revision 28, CCP Acceptable Knowledge Documentation, Attachment 8 – Waste Containers List, OR-CRF-CH-HET, May 16, 2016

CCP-TP-005, Revision 28, CCP Acceptable Knowledge Documentation, Attachment 9 – Interface Waste Management Documents List, OR-CRF-CH-HET, October 31, 2016

CCP-TP-005, Revision 29, CCP Acceptable Knowledge Documentation, Attachment 1 – Acceptable Knowledge Documentation Checklist, OR-NFS-CH-HET-A, July 6, 2017

CCP-TP-005, Revision 29, CCP Acceptable Knowledge Documentation, Attachment 1 – Acceptable Knowledge Documentation Checklist, OR-NFS-CH-SOIL, July 6, 2017

CCP-TP-005, Revision 29, CCP Acceptable Knowledge Documentation, Attachment 1 – Acceptable Knowledge Documentation Checklist, OR-REDC-CH-HET, March 30, 2017

CCP-TP-005, Revision 29, CCP Acceptable Knowledge Documentation, Attachment 1 – Acceptable Knowledge Documentation Checklist, OR-REDC-RH-HET, November 7, 2017

CCP-TP-005, Revision 29, CCP Acceptable Knowledge Documentation, Attachment 13 – CCP Waste Stream Characterization Checklist, OR-NFS-CH-SOIL, Lots 18–33, July 26, 2017–September 27, 2017

CCP-TP-005, Revision 29, CCP Acceptable Knowledge Documentation, Attachment 14 – CCP Acceptable Knowledge Accuracy Report, OR-CHEM-CH-HET, Lot 8, June 19, 2017, with memoranda and other attachments

CCP-TP-005, Revision 29, CCP Acceptable Knowledge Documentation, Attachment 14 – CCP Acceptable Knowledge Accuracy Report, OR-NFS-CH-HET-A, Lot 25, June 19, 2017, with memoranda and other attachments

CCP-TP-005, Revision 29, CCP Acceptable Knowledge Documentation, Attachment 14 – CCP Acceptable Knowledge Accuracy Report, OR-NFS-CH-HET-A, No New Lots, February 28, 2018, with memoranda and other attachments

CCP-TP-005, Revision 29, CCP Acceptable Knowledge Documentation, Attachment 14 – CCP Acceptable Knowledge Accuracy Report, OR-NFS-CH-SOIL, Lots 18–33, February 28, 2018, with memoranda and other attachments

CCP-TP-005, Revision 29, CCP Acceptable Knowledge Documentation, Attachment 14 – CCP Acceptable Knowledge Accuracy Report, OR-NFS-CH-SOIL, No New Lots, March 31, 2017, with memoranda and other attachments

CCP-TP-005, Revision 29, CCP Acceptable Knowledge Documentation, Attachment 14 – CCP Acceptable Knowledge Accuracy Report, OR-REDC-CH-HET, Lots 77–79, March 31, 2017, with memorandum and other attachments

CCP-TP-005, Revision 29, CCP Acceptable Knowledge Documentation, Attachment 4 – Acceptable Knowledge Source Document Information List, OR-CRF-CH-HET, April 4, 2017, and March 6, 2018

CCP-TP-005, Revision 29, CCP Acceptable Knowledge Documentation, Attachment 4 – Acceptable Knowledge Source Document Information List, OR-NFS-CH-HET-A, July 10, 2017

CCP-TP-005, Revision 29, CCP Acceptable Knowledge Documentation, Attachment 4 – Acceptable Knowledge Source Document Information List, OR-NFS-CH-SOIL, July 10, 2017

CCP-TP-005, Revision 29, CCP Acceptable Knowledge Documentation, Attachment 4 – Acceptable Knowledge Source Document Information List, OR-REDC-CH-HET, April 4, 2017

CCP-TP-005, Revision 29, CCP Acceptable Knowledge Documentation, Attachment 4 – Acceptable Knowledge Source Document Information List, OR-REDC-RH-HET, November 13, 2017

CCP-TP-005, Revision 29, CCP Acceptable Knowledge Documentation, Attachment 6 – Waste Form, Waste Material Parameters, Prohibited Items, and Packaging, OR-NFS-CH-HET-A, July 6, 2017, with Memorandum September 17, 2009

CCP-TP-005, Revision 29, CCP Acceptable Knowledge Documentation, Attachment 6 – Waste Form, Waste Material Parameters, Prohibited Items, and Packaging, OR-NFS-CH-SOIL, July 6, 2017, with Memorandum, January 16, 2014

CCP-TP-005, Revision 29, CCP Acceptable Knowledge Documentation, Attachment 6 – Waste Form, Waste Material Parameters, Prohibited Items, and Packaging, OR-REDC-CH-HET, March 27, 2017, with Memorandum, July 11, 2008

CCP-TP-005, Revision 29, CCP Acceptable Knowledge Documentation, Attachment 6 – Waste Form, Waste Material Parameters, Prohibited Items, and Packaging, OR-REDC-RH-HET, October 3, 2017, with Memoranda March 29, 2016, and July 11, 2008

CCP-TP-005, Revision 29, CCP Acceptable Knowledge Documentation, Attachment 7 – Radionuclides, OR-NFS-CH-HET-A, July 6, 2017, with Memorandum, May 28, 2014

CCP-TP-005, Revision 29, CCP Acceptable Knowledge Documentation, Attachment 7 – Radionuclides, OR-NFS-CH-SOIL, July 6, 2017, with Memorandum, May 28, 2014

CCP-TP-005, Revision 29, CCP Acceptable Knowledge Documentation, Attachment 7 – Radionuclides, OR-REDC-CH-HET, September 7, 2017, with Memorandum, September 6, 2017

CCP-TP-005, Revision 29, CCP Acceptable Knowledge Documentation, Attachment 8 – Waste Containers List, OR-CHEM-CH-HET, February 19, 2018

CCP-TP-005, Revision 29, CCP Acceptable Knowledge Documentation, Attachment 8 – Waste Containers List, OR-REDC-CH-HET, February 19, 2018

CCP-TP-005, Revision 29, CCP Acceptable Knowledge Documentation, Attachment 9 – Interface Waste Management Documents List, OR-CHEM-CH-HET, OR-CHEM-RH-HET, June 5, 2017, and December 20, 2017

CCP-TP-005, Revision 29, CCP Acceptable Knowledge Documentation, Attachment 9 – Interface Waste Management Documents List, OR-REDC-CH-HET, OR-REDC-RH-HET, June 5, 2017

CCP-TP-005, Revision 29, CCP Acceptable Knowledge Documentation, Attachment 9 – Interface Waste Management Documents List, OR-REDC-CH-HET, September 27, 2017

CH ORNL-CCP AK Tracking Spreadsheet, February 28, 2018

Characterization Information Summary, WSPF No. OR-NFS-CH-HET-A, Lot 25, March 3, 2016

Characterization Information Summary, WSPF No. OR-NFS-CH-SOIL, Lots 18–33, various dates

Characterization Information Summary, WSPF No. OR-REDC-CH-HET, Lots 78–79, April 11, 2016, and May 10, 2016

DR051, Discrepancy Resolution, re: Aluminum Powder in REDC Waste, Jeff Harrison, DR051, November 2, 2016

Inter-Office Correspondence from D. W. Moody to CCP Records Custodian, EPA Acceptable Knowledge Accuracy Report: Oak Ridge National Laboratory Remote-Handled Transuranic, CCP-AK-ORNL-500, Waste Stream Number OR-REDC-RH-HET, Lots 1 through 35, March 16, 2017

Inter-Office Correspondence from R. C. Martin to CCP Records Custodian, EPA Acceptable Knowledge Accuracy Report: Oak Ridge National Laboratory Remote-Handled Transuranic, CCP-AK-ORNL-500, Waste Stream Number OR-REDC-RH-HET, No New Lots, March 1, 2018

Letter from J.R. Stroble, Carlsbad Field Office, to Tom Peake, U.S. Environmental Protection Agency, re: Tier 1 Request for Waste Stream OR-REDC-RH-HET, Appendices G and H and the Oak Ridge National Laboratory, September 20, 2017

M032, Prohibited Item Processing and Waste Nonconformance Reports for OR-CRF-CH-HET Waste, various authors, various dates

M033, Evaluation of Additional Containers for Waste Stream OR-CRF-CH-HET, Sherrod Reavis, April 3, 2017

M073, TWPC Contact Handled Waste Repackaging Data Forms for Building 7920 Waste, ORNL, various dates

M100, Container Paperwork for Containers in Waste Stream OR-REDC-RH-HET (UCN-2109), various authors, various dates

M155, Evaluations of Additional Drums for Waste Stream OR-REDC-CH-HET, Kevin Peters, et al., Various Dates

M157, UCN-2109 and UCN-2822 Forms and Associated Container Paperwork for Building 2026, various authors, various dates

M159, Contact Handled Waste Repackaging Data Forms and Visual Examination Technique Data Forms for Waste Stream OR-CHEM-CH-HET, various authors, various dates

M175, Evaluation of Additional Drums for Waste Stream OR-CHEM-CH-HET, various dates

M234, Container Paperwork for Waste Generated in Building 7930 including UCN-2822 and UCN-2109 Forms, ORNL, various dates

M273, Generator Container Paperwork for Building 4507, various authors, various dates

M274, Contact-Handled Waste Repackaging Data Forms and Visual Examination Forms for Building 4507, various authors, various dates

M286, Incoming Container Travelers for REDC Waste, various authors, various dates

M287, Prohibited Item Processing and Waste Nonconformance Reports for REDC Waste, various authors, various dates

M297, Building 7920 – Campaign Sequence for Post-2007 and Post-2014, no author, not dated

NCR-ORNL-0128-17, Revision 0, September 28, 2017

NCR-ORNL-0129-17, Revision 0, September 28, 2017; Closed February 9, 2018

Notification of Tier 2 Changes for AMWTP and CCP Activities for FY 2016 4th Quarter, December 2, 2016

Notification of Tier 2 Changes for AMWTP and CCP Activities for FY 2017 1st Quarter, February 17, 2017

Notification of Tier 2 Changes for AMWTP and CCP Activities for FY 2017 2nd Quarter, July 5, 2017

Notification of Tier 2 Changes for AMWTP and CCP Activities for FY 2017 3rd Quarter, October 5, 2017

Notification of Tier 2 Changes for AMWTP and CCP Activities for FY 2017 4th Quarter, January 22, 2018

P1214, Revised Safety Analyses for Building 3019-B, J.F. Emeryl, ORNL/CF-82/260, ORNL - Union Carbide Corporation, September 7, 1982

P1402, 234 Wet Cell Characterization Summary, Mark Wetherill, DCM-03-017-002, May 28, 2010

P1439, Standard Operating Procedure for Assisting Generators with Waste and Excess Materials, Carolyn Waugh, TWMD-TP-574, Revision 4 (Older Versions Included), May 1, 2015

P1443, Remote Handled Waste Repackaging, RH-REF-OP-021, Revision 4 (Older Versions Included), December 5, 2016

P1444, Contact Handled Waste Container Selection Process, CH-P-WP-001, Revision 0 (Older Versions Included), August 15, 2017

P1489, RH TRU Waste Handling at Building 7930, NNFD-7930-OP-191, Revision CN-1 (Older Versions Included), April 12, 2013

P254, Contact Handled Waste Repackaging, CH-REF-OP-013, Revisions 10–12, April 19, 2016, to August 31, 2017

P432, TRU Waste Processing Center Documented Safety Analysis, CM-R-AD-001, Revision 35 (Older Versions Included), February 16, 2017

P517, Safety Analysis for Building 3019-B, L.T. Corbin, ORNL/CF-74-7-36, ORNL - Union Carbide Corporation, July 29, 1974

P584, Hot Cell Operations, RH-UET-OP-002, Revision 8 (Older Versions Included), March 1, 2017

P585, Remote Handled Drum In/Out Operations, RH-REF-OP-003, Revision 9 (Older Versions Included), September 6, 2016

P590, Liquids Handling in the Hot Cell, RH-REF-OP-014, Revision 3 (Older Versions Included), October 1, 2015

P591, Liquids Handling in the Cask Processing Enclosure, RH-REF-OP-102, Revision 4 (Older Versions Included), June 6, 2017

P592, Absorbing Liquids in the Glovebox and Box Breakdown Area, CH-REF-OP-014, Revision PCN 5-1 (Older Versions Included), August 27, 2015

P988, CH-TRU Waste Handling at Building 7920, K. Wilson, NNFD-7920-OP-190, Revision 0, February 23, 2010

P994, CH-TRU Waste Handling at REDC, NNFD-REDC-004, Revision 0, July 20, 2015

Preview of Tier 2 Changes for ORNL-CCP Activities for FY 2018 1st Quarter, provided February 1, 2018

RH ORNL-CCP AK Tracking Spreadsheet, February 7, 2018

SPM Qualification Card for Beverly Schrock, June 23, 2010

SPM Qualification Card for Carolina Soaterna, May 31, 2011

SPM Qualification Card for Charles Turner, April 19, 2007

SPM Qualification Card for Christopher Hatch, July 13, 2017

SPM Qualification Card for Craig Simmons, December 8, 2014

SPM Qualification Card for Daniel Wade, October 23, 2013

SPM Qualification Card for David Moody, July 9, 2015

SPM Qualification Card for Jake Knox, October 23, 2013

SPM Qualification Card for Joe Stepzinski, March 2, 2017

SPM Qualification Card for Laura Turner, September 10, 2015

SPM Qualification Card for Mike Ramirez, November 3, 2016

SPM Qualification Card for Rich Kantrowitz, February 19, 2015

SPM Qualification Card for Rick Whitely, October 31, 2013

SPM Qualification Card for Roger Whiteaker, May 3, 2012

SPM Qualification Card for Ryan Martin, January 2, 2018

SPM Qualification Card for Terri-Anne Groover, December 4, 2014

SPM RH Qualification Card for Beverly Schrock, January 18, 2017

SPM RH Qualification Card for Carolina Soaterna, September 12, 2016

SPM RH Qualification Card for Charles Turner, August 15, 2013

SPM RH Qualification Card for Craig Simmons, September 17, 2009

SPM RH Qualification Card for David Moody, August 28, 2013

SPM RH Qualification Card for Jake Knox, December 21, 2017

SPM RH Qualification Card for Rich Kantrowitz, October 29, 2012

SPM RH Qualification Card for Ryan Martin, December 9, 2016

U038, ORNL TRU Waste Historical Survey; Volumes 1, 2, and 3 – Origins and Characteristics of Remote-Handled Transuranic Wastes (Trabalka report) plus Appendices, J.R. Trabalka, A.J. Mattus, S.N. Storch, BJC/OR-395-V/1,2,3, Draft, September 2001

U058, Oak Ridge National Laboratory/Nuclear Fuel Services Inc. NFS Waste Parameter Verification Program, undated

U090, ORNL RH TRU Data Extracted from Process Information Package for Radiological Characterization for Campaigns 68, 69, 70, 71, 72, 73, and M1, ORNL, various dates

U091, ORNL RH TRU Data Extracted REDC Process Information Package for Radiological Characterization for Campaigns M2, M3, M4, M5, MS. M7, M8, M9, M10, M11, M12, M13, M14, M15, M16, ORNL, various dates

U092, ORNL RH TRU Data Extracted REDC Process Information Package for Radiological Characterization for Campaigns: 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67 – SETF Period, ORNL, various dates

U093, ORNL RH TRU Data Extracted REDC Process Information Package for Radiological Characterization for Campaigns: 33–55 – Pre-SETF Period, ORNL, various dates

U659, CCP Calculation Package: Direct Assay Data Analysis, J. Vance, ONRL-RH-41, Revision 0, April 6, 2009, and Revision 1, June 2, 2009

U660, CCP Calculation Package: Direct Assay Data Analysis - Pre-SETF, J. Vance, ORNL-RH-42, Revision 0, June 1, 2009

Waste Stream Profile Form, Waste Stream Profile Number: OR-REDC-RH-HET, February 18, 2009, with associated attachments

WIPP Form 17-689, July 11, 2017

NDA

Approval Status Notification for CCP-ORNL Drum Cycle 24A for the NDA PDP Memo, CBFO, July 17, 2017

CCP-SO-127, Revision 0, Incorporation of CCP-QP-040 Requirements into CCP-QP-002, April 4, 2017

CCP-SO-ORNL-029, Dead Time Monitoring for Containers Run under CCP_TP_047, Revision 12, CCP Mobile IQ3 Gamma Scanner Operation at ORNL/TWPV, November 11, 2015

CCP-SO-ORNL-014, Revision 7, NDA Liquid Nitrogen (LN2) Fill, February 11, 2014

CCP-TP-046, Revision 6, CCP Mobile IQ3 System Calibration Procedure, Mike Ramirez, July 22, 2016

CCP-TP-047, Revision 13, CCP Mobile IQ3 Gamma Scanner Operation, Mike Ramirez, July 22, 2016

CCP-TP-048, Revision 17, CCP ORNL NDA System Data Reviewing, Validating, and Reporting Procedure, Mike Ramirez, July 22, 2016

CCP-TP-076, Revision 2, CCP Operating the Mobile ISOCS Large Container Counter Using NDA 2000, Mike Ramirez, July 22, 2016

CCP-TP-077, Revision 2, CCP Calibrating the Mobile ISOCS Large Container Counter Using NDA 2000, Mike Ramirez, July 22, 2016

CI-MILCC2-CAL-NDA-1003, Calibration Confirmation Report for Measurements of 6" and 12" Pipe Overpack Containers Using the MCS MILCC2, Revision 0, February 11, 2015

CI-MILCC2-NDA-1001, Calibration Report for the MCS Mobile ISOCS Large Container Counter 2 (MILCC2) at the Transuranic Waste Processing Center in Oak Ridge, TN, Revision A, August 20, 2014

CI-MILCC2-NDA-1002, Oak Ridge Mobile ISOCS Large Container Counter 2 (MILCC2) Total Measurement Uncertainty Report, Revision A, 8-15-2014, and Revision B, March 11, 2015

CI-MILCC2-NDA-1009, Calibration Verification Report for the MCS MILCC2, Revision 0, March 7, 2017

EPA Replicate Testing for WIPP Nondestructive Assay (NDA) Systems, U.S. Environmental Protection Agency, Revision 2, June 2002

IQ3 BDR Nos. OR-IQ3-0702, OR-IQ3-0706 and OR-IQ3-0771

IQ3, MILCC2 and DTC Qualification Cards: Susan Anderson, Bob Ceo, Daniel Crosby, Chad Gerlock, Kevin Meyer, Bart Morales, Spencer Pattee, Tim Southworth and Ron Whitson

IQ3 NCR Nos. NCR-ORNL-0009-17, NCR-ORNL-010-17, NCR-ORNL-0014-17, NCR-ORNL-0015-17 and NCR-ORNL-0584-17

IQ3 NDA Operational Logbook, CCP-CH-ORNL-NDA-IQ3-02, ORNL TWPC, Building 7880MM

MCS-IQ3-CAL-CONF-RPT-2013-01, Calibration Confirmation, Verification, and LLD Report for the MCS IQ3, Revision 1, February 5, 2014

MCS-IQ3-CALIB-2012, Calibration Report for the MCS IQ3, Revision 1, February 5, 2014

MCS-IQ3-CALVER-2016-03, Calibration Verification Report for the MCS IQ3, Revision 0, December 14, 2016

MCS-IQ3-CALVER-2017-01, Calibration Verification Report for the MCS IQ3, Revision 0, March 29, 2017

MCS-IQ3-CALVER-2017-02, Calibration Verification Report for the MCS IQ3, Revision 0, August 30, 2017

MCS-IQ3-CALVER-2017-03, Calibration Verification Report for the MCS IQ3, Revision 0, September 21, 2017

MCS-IQ3-TMU-2009, Total Measurement Uncertainty for the MCS IQ3, Revision 0, July 8, 2009

MILCC2 BDR Nos. OR-MILCC2-0389, OR-MILCC2-0401 and OR-MILCC2-0407

MILCC2 NDA Operational Logbook, ORNL-TWPC-BLDG 7880, Operational Logbook 2018-02

MIRION-IQ3-CALVER-2018-01, Calibration Verification Report for the MCS IQ3, Revision 0, February 28, 2018

MILCC2 NCR Nos. NCR-ORNL-0458-17, NCR-ORNL-0470-17 and NCR No. NCR-ORNL-0414-16.

OA-ORNL-0123-11 R.2, NDA Operator Posting

OA-ORNL-0133-14 R.0, NDA Operator Posting

OA-ORNL-0135 R.0, NDA Operator Posting

ORNL-CCP IQ3 & MILCC2 List of Qualified Individuals, Various dates

RPT-80008.003-001, Revision 1, Performance Demonstration Program for Nondestructive Assay of Drummed Wastes, Scoring Report-Cycle 24A, May 2017 Distribution; August 2017

Transuranic Waste Acceptance Criteria for the Waste Isolation Pilot Plant, U.S. Department of Energy, DOE/WIPP-02-3122, Revision 8, July 5, 2016

DTC

C0677, Calibration Certificate, ThermoFisher Scientific, FHZ 612, August 08, 2017

CCP Operator Aid: OA-ORNL-0160-18, February 1, 2018

CCP-TP-504, Revision 20, CCP Dose-to-Curie Survey Procedure for Remote-Handled Transuranic Waste, February 20, 2018

Certificate of Calibration, Ludlum Measurements, Inc., XC1002, Model 2363, March 29, 2016

Certificate of Calibration, MSI7200 DynaLink, S/N 51344, Measurement Systems International, October 8, 2010

Certificate of Calibration, Precision Metrology, Certificate Number 1001962189, XC1001, Survey Meter Ludlum 2363, February 6, 2017

CM-P-RP-304, Attachment B, Sealed Radioactive Source Information Form Model 50240/100, CF-252 Source, September 3, 2009

DTC BDR Nos. ORRHDTC17011, ORRHDTC17014, ORRHDTC17016, RRHDTC18001 and ORRHDTC18003

List of Qualified Individuals (LOQI) for CH VE, RH VE and RTR Spreadsheets, range of applicable dates including OQI ORNL_2018-3-6_3_00_AM.xlxs

List of FHZ 612 Gamma Probes with Calibration Dates: XC0894, October 2, 2016; XC0761, September 1, 2017; XC0677, 8-2-2018

List of 4241-L Neutron Probes with Calibration Dates: XC1002, March 29, 2017; XC1001, February 6, 2018

List of 12-4 Neutron Probes with Certificate Dates: WIPP191-170417, April 18, 2017; WIPP192, 2-12-2018, WIPP191-180711, July 17, 2018

Ludlum Measurements, Inc., Certificate of Calibration Model 2363, Serial No. 323695, March 29, 2016

Ludlum Measurements, Inc., Certificate of Calibration Model 2363, Serial No. 320171, March 9, 2016

Nominal Source Data Sheet, Isotope Products Laboratories, Cesium in Ceramic Matrix, December 2, 2011

Operational Logbook for Remote Handled Operations, Control No. CCP-RH-ORNL-DTC-02, February 1, 2018, ORNL Building 7800, Process Building.

ORNL-CCP DTC, List of Qualified Individuals (LOQI), Excel Spreadsheets, Various dates, including: LOQI – ORNL_2017-7-27_3_00_AM.xlxs and ORNL_2018-3-6_00_AM.xlxs

ORNL RH ORNL AK Tracking Spreadsheets: 2-7-2018_10_11_19AM.xlxs; ORNL_2017-10-26_3_00_AM.xlxs, ORNL_2017-10-27_3_00_AM.xlxs, ORNL_2017-12-5_3_00_AM.xlxs, ORNL_2018-1-10_3_00_AM.xlxs, ORNL_2018-1-11_3_00_AM.xlxs

Post-2014 DTC Spreadsheet.xlsx, Revision 1, Addendum 1, SCO 1239 per ORNL_SIL_3-5-2018

TRU Waste Processing Center, Preparation of Calculations, CM-P-EG-006/Revision 1, Calculation No.: RH-FW-C-RP-OO6, Revision 2; RH Drum Contact Dose Rate from 1-meter Measurements, Scott A. Byers, February 16, 2009

WIPP191-170417, Oak Ridge National Laboratory Radiation Standards and Calibration Laboratory, Ludlum 12-4 Neutron Instrument Certificate of Calibration, April 18, 2016

WIPP191-180211, Oak Ridge National Laboratory Radiation Standards and Calibration Laboratory, Ludlum 12-4 Neutron Instrument Certificate of Calibration, February 13, 2017

WIPP191-180711, Oak Ridge National Laboratory Radiation Standards and Calibration Laboratory, Ludlum 12-4 Neutron Instrument Certificate of Calibration, July 17, 2017

XC0761, Thermo Scientific, As Left Calibration Certificate, FHZ 612, September 1, 2016

XC0894, Thermo Scientific, As Left Calibration Certificate, FHZ 612, October 2, 2015

NDE

Acknowledgements of CCP-QP-002, Revision 44, February 14, 2018

Acknowledgements of CCP-QP-005, Revision 25, February 14, 2018

Acknowledgements of CCP-TP-002, Revision 27, February 14, 2018

Acknowledgements of CCP-TP-005, Revision 29, February 14, 2018

Acknowledgements of CCP-TP-200, Revision 3, February 14, 2018

American Society for Nondestructive Testing, Recommended Practices, No. SNT-TC-1A, June 1980 Edition

Audio/visual recordings for selected containers from RTR BDR No. OR-RTR6-0713

CCP NDE Operator Aid OA-ORNL-0129, R1, posted in RTR enclosure

CCP Radiography Data Sheet, CCOP-TP-053, Attachment 2, Container No. X10C9402660G from RTR Batch OR-RTR6-0773 generated August 3, 2016, during EPA inspection

CCP-QP-002, CCP Training and Qualification Plan, Revision 44, July 22, 2016

CCP-TP-028, CCP Radiographic Training Container Construction, Revision 10

CCP-TP-053, CCP CH Standard Real-Time Radiography Inspection Procedure, Revision 16, July 26, 2016

CCP-TP-068, Revision 12, December 8, 2015

CCP-TP-113, Revision 21, October 12, 2017

CCP-TP-165, Revision 3, November 5, 2013

CCP-TP-500, CCP Remote-Handled Waste Visual Examination, Revision 15, May 6, 2015

CH VE BDR Nos. ORVECH0162 and ORVECH0190 (Draft)

CH VEE appointment letters for Derek Matheny (June 23, 2015), Pat Tilmon (April 6, 2015), Anthony Harley (November 8, 2017) and Tommy Mojica (August 7, 2014)

Completed Attachment 1 from CCP-TP-001, Revision 21, CCP Project Level Data Validation and Verification Checklist and Summary from RTR BDR No. OR-RTR6-0874 (Draft)

Completed Attachment 2 from CCP-TP-113, Revision 19, Contact-Handled Waste Visual Examination; CCP Waste Visual Examination Data Form for Container No. X10C9311083-A1

Completed Attachments 1–3 from CCP-TP-113, Revision 19, Contact-Handled Waste Visual Examination, CCP Waste Visual Examination Data Form, for Container No. X10C0402810A1 from RTR BDR No. OR-RTR6-0874 (Draft)

Inventory sheets for RTR Container Nos. NDE-TEST-59, NDE-TEST-60, NDE-TEST-68, NDE-TEST-69, NDE-TEST-70 and NDE-TEST-74

ITR Review from CCP-TP-500, Attachment 2, and SPM Review from CCP-TP-500, Attachment 3 from RTR BDR No. OR-RTR6-0874 (Draft)

NDT Level-II Limited Certificates for Eric Lyles, Fred Oney, Dale Simpson, Aaron Elliot and Tony Johnson

Operational Log Book CCP-CH-ORNL-RTR-UNIT 6-02-2018

Qualification Cards and Training Packages for CH VE Operators Gilbert Gutierrez, Anthony Harley, Derek Matheny, Tommy Mojica and Pat Tilmon

Qualification Cards and Training Packages for VEEs Derek Matheny, Anthony Harley, Tommy Mojica and Pat Tilmon

Qualification Cards and Training Packages for RH VE Operators Derek Matheny, Spencer Pattee, Tommy Mojica, Perrie Sands, Shawn Treadway, Gilbert Gutierrez, David Lawrence, Anthony Harley and Pat Tilmon

Qualification Cards and Training Packages for RTR Operators Aaron Elliot, Thaddeus Hasselstrom, Tony Johnson, Eric Lyles, Fred Oney and Dale Simpson

RH ORNL NDE Personnel Waste Stream Qualified Individuals

RH VE BDR Nos. ORNLRHVE16023, ORNLRHVE16046, ORNLRHVE167038, ORNLRHVE17053 and ORNLRHVE17064

RH VEE appointment letters for Derek Matheny (June 23, 2015) and Pat Tilmon (April 6, 2015)

RTR BDR Nos. OR-RTR6-0713, OR-RTR6-0771, OR-RTR6-0773, OR-RTR6-07717, OR-RTR6-0789, OR-RTR6-0874 (Draft) and OR-RTR6-0749

RTR NCR Nos. NCR-ORNL-0078-16, NCR-ORNL-0078-17, NCR-ORNL-0079-16, NCR-ORNL-0080-16, NCR-ORNL-0081-16, NCR-ORNL-0226170, NCR-ORNL-0232170 and NCR-ORNL-0233170, NCR-ORNL-0329-16

RTR Audio-visual Recording Nos. OR-RTR6-0771, OR-RTR6-0773, OR-RTR6-0777 and OR-RTR6-0874

RTR Logbook No. OLB-CCP-CH-ORNL-RTR-UNIT 6-02-2018

Training Container Evaluation Data Sheets for RTR Operators Aaron Elliot, Thaddeus Hasselstrom, Tony Johnson, Eric Lyles, Fred Oney and Dale Simpson

Training roster for CCP-AK-ORNL-002, Revision 4, and CCP-AK-ORNL-500, Revision 5

Training roster for WAC Changes to CCP-QP-002, CCP-TP-028 and CCP-TP-053