

**DOCKET NO: A-98-49, Item II-A4-55**

**WASTE CHARACTERIZATION REPORT**

**EPA INSPECTION NO. EPA-LANL-CCP-OSRP-05.05-8  
OF THE OFFSITE SOURCE RECOVERY PROGRAM (OSRP)  
AS IMPLEMENTED BY THE  
LOS ALAMOS NATIONAL LABORATORY (LANL)  
CENTRAL CHARACTERIZATION PROJECT (CCP)  
April 11 - 15, 2005**

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

**June 2005**

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## **ATTACHMENT**

### **Attachment A. Acceptable Knowledge (AK) Checklist**

## 1.0 EXECUTIVE SUMMARY

In accordance with 40 CFR 194.8, from April 11-15, 2005, the U.S. Environmental Protection Agency (EPA or the Agency) conducted EPA inspection number EPA-LANL-CCP-OSRP-05.05-8 of the Offsite Source Recovery Program (OSRP) as implemented by the Central Characterization Project (CCP) at the Los Alamos National Laboratory (LANL) in New Mexico<sup>1</sup>. The purpose of the inspection is to verify that this site is able to characterize all wastes proposed for disposal in the Waste Isolation Pilot Plant (WIPP) as required by 40 CFR 194.24(c)(4).

EPA must verify compliance with 40 CFR 194.24 before waste may be disposed of at WIPP, as specified in Condition 3 of the Agency's certification of the WIPP's compliance with disposal regulations for transuranic (TRU) radioactive waste (63 *Federal Register* 27354, 27405, May 18, 1998).

The waste characterization (WC) systems and processes that EPA inspected were Acceptable Knowledge (AK) and Visual Examination (VE), both of which are used to characterize or track Sealed Sources intended for disposal at the WIPP. This inspection report focuses only on the waste characterization techniques applicable to Sealed Sources (classified as debris waste, S5000). OSRP is responsible for the recovery, the preparation of AK documentation for quantifying radiological contents of each Sealed Source, and the VE while packaging in TRU waste containers. EPA inspected AK and VE-specific processes performed by OSRP. OSRP has recovered and packaged 100 Sealed Sources to date and these are in temporary storage at LANL and the Nevada Test Site. LANL CCP is responsible for using the other EPA-approved TRU waste characterization processes (such as AK Summaries, waste stream profile forms, validation/verification, and WWIS tracking) to comply with the WC requirements applicable to Sealed Sources as TRU debris waste.

EPA's inspection team determined that the characterization program implemented at LANL using AK and VE, as inspected, can adequately characterize contact-handled (CH) newly-generated TRU debris (S5000) wastes, specifically Sealed Sources characterized under the LANL CCP OSRP. The EPA inspection team did not identify any findings as a result of this inspection. The EPA inspection team did identify one concern that does not require a response from DOE at this time. EPA may verify steps taken to address this concern during a future inspection.

Note that this approval is limited to LANL CCP characterized Sealed Sources of defense origin only. LANL CCP may not process OSRP recovered Sealed Sources with non-defense source. Also, OSRP may not package a Sealed Source of non-defense origin with that of a Sealed Source of defense origin in the same TRU waste containers destined for the disposal at WIPP.

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<sup>1</sup> Evaluation of the Offsite Source Recovery Program was conducted as part of Inspection No. EPA-LANL-CCP-05.05-8 that evaluated several aspects of the TRU waste characterization program implemented by LANL CCP, including AK, NDA, VE, RTR and WWIS. These characterization techniques are discussed in a separate report. This report addresses only the OSRP Program as implemented by LANL-CCP.

The Table below provides a summary of EPA's approvals of the LANL CCP's CH TRU waste characterization processes.

### Summary of EPA Approvals

Waste Characterization Element	OSRP Sealed Sources	Debris Waste	Solid Waste
Acceptable Knowledge	Approved - June 2005	Approved - August 2004	Approved - August 2004
Nondestructive Assay	Not Applicable	Approved - August 2004: - HENC - PTGS/FRAM System 1 and 3	Approved - August 2004: - HENC - PTGS/FRAM System 1 and 3
Nondestructive Examination	Approved (VE only) - June 2005	Approved (VE and RTR) - August 2004	Approved (VE and RTR) - August 2004
WIPP Waste Information System	Approved - June 2005	Approved - August 2004	Approved - August 2004
Load Management	Not approved	Approved - June 2005	Not approved

## 2.0 PURPOSE OF INSPECTIONS

On May 18, 1998, the U.S. Environmental Protection Agency (EPA or Agency) certified that the Waste Isolation Pilot Plant (WIPP) will comply with the radioactive waste disposal regulations at 40 CFR 191. In this certification, EPA also included Condition No. 3, which states that “the Secretary shall not allow shipment of any waste from . . . any waste generator site other than LANL [Los Alamos National Laboratory] for disposal at the WIPP until the Agency has approved the processes for characterizing those waste streams for shipment using the process set forth in §194.8.” The approval process described at 40 CFR 194.8 requires the Department of Energy (DOE or Department) to: (1) provide EPA with information on process knowledge<sup>2</sup> for waste streams proposed for disposal at WIPP, and (2) implement a system of controls used to confirm that the total amount of each waste component that will be emplaced in the WIPP will not exceed limits identified in the WIPP Compliance Certification Application (CCA). An EPA inspection team visits the site to verify through a demonstration that process knowledge and other elements of the system of controls are technically adequate and are being implemented properly. Specifically, EPA’s inspection team verifies compliance with 40 CFR 194.24(c)(4), which states:

\*\*\* Any compliance application shall: \*\*\* Provide information which demonstrates that a system of controls has been and will continue to be implemented to confirm that the total amount of each waste component that will be emplaced in the disposal system will not exceed the upper limiting value or fall below the lower limiting value described in the introductory text of paragraph of this section.<sup>3</sup> The system of controls shall include, but shall not be limited to: measurement; sampling; chain of custody records; record keeping systems; waste loading schemes used; and other documentation.

In other words, the purpose of inspections is to verify that the DOE waste generator sites, which characterize transuranic (TRU) waste prior to shipment to WIPP, are characterizing and tracking the waste in such a manner that EPA is confident that the waste will not exceed the approved limits. By approving waste characterization systems and processes at LANL as implemented by the OSRP Program, EPA has evaluated capabilities of those systems and processes to accomplish two tasks: (1) they can identify and measure the waste components (such as plutonium) that must be tracked for compliance;<sup>4</sup> and (2) they can confirm that the waste in any given container

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<sup>2</sup> Process knowledge refers to knowledge of waste characteristics derived from information on the materials or processes used to generate the waste. This information may include administrative, procurement, and quality control documentation associated with the generating process, or past sampling and analytic data. Usually, the major elements of process knowledge include information about the process used to generate the waste, material inputs to the process, and the time period during which the waste was generated. In the context of these reports specifically and waste characterization generally, EPA uses the term “acceptable knowledge” synonymously with “process knowledge.”

<sup>3</sup> The introductory text of paragraph 40 CFR 194.24(c) states: “For each waste component identified and assessed pursuant to [40 CFR 194.24(b)], the Department shall specify the limiting value (expressed as an upper or lower limit of mass, volume, curies, concentration, etc.), and the associated uncertainty (i.e., margin of error) for each limiting value, of the total inventory of such waste proposed for disposal in the disposal system.”

<sup>4</sup> The potential contents of a waste stream or group of waste streams determine which processes can adequately characterize the waste. For example, if acceptable knowledge information suggests that the waste form is heterogeneous, the site should select a nondestructive assay technique that suits such waste in order for adequate

has been properly identified as belonging to the group of approved waste streams. Under 40 CFR 194.8(b)(4), EPA is authorized to perform follow-up inspections to verify that a TRU waste generator is properly characterizing the relevant waste streams and that it is shipping waste that belongs only to those waste streams or groups of waste streams that have been characterized by the approved waste characterization processes.

### **3.0 PURPOSE OF THIS REPORT**

This waste characterization inspection report documents the basis for EPA's approval decision and explains the results of Inspection No. EPA-LANL-CCP-OSRP-05.05-8 related to the LANL CCP OSRP in terms of findings or concerns. The report documents and provides objective evidence of outstanding findings, as applicable. The report also describes any tests or demonstrations completed during the course of the inspection that were pertinent to the decision basis. The completed checklists attached to the report list the documents that EPA's inspection team reviewed. If you wish to see any items identified in the attached checklists, please contact:

Quality Assurance Manager  
USDOE/Carlsbad Field Office  
P.O. Box 3090  
Carlsbad, NM 88221

EPA's decision to approve or disapprove the system of controls (processes) used to characterize one or more waste streams at a site is conveyed to DOE separately by letter, in accordance with 40 CFR 194.8(b)(3). This report identifies and explains the basis for EPA's decision as contained in the letter. EPA's approval or disapproval extends only to the processes reviewed during the inspection and identified in this report and its attachments. Only waste that can be adequately characterized using processes verified by EPA through inspections may be shipped to WIPP for disposal. Also, approved processes may be used to characterize not just existing waste, but also waste belonging to the subject waste stream(s) that will be generated in the future.

### **4.0 SCOPE**

The scope of this inspection covered the determination of the technical adequacy of the systems used to characterize wastes under the purview of the Offsite Source Recovery Program (OSRP) as implemented by the CCP at LANL. This report presents the results of the EPA's inspection of CCP's compilation of Acceptable Knowledge (AK) documentation using the OSRP-provided radiological characterization data and Visual Examination (VE) while packaging as newly-generated TRU waste of sealed radionuclide sources (referred here as Sealed Sources). This inspection did not evaluate the adequacy of peer review of OSRP's radiological characterization data for Sealed Sources. The radiological characterization of WIPP-bound TRU wastes that is

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measurements to be obtained. Radiography and visual examination help both to confirm and quantify waste components such as cellulose, rubbers, plastics, and metals. Once the nature of the waste has been confirmed, the assay techniques then quantify the radioactive isotopes in the waste. In the given example, a TRU waste site may be able to characterize a wide range of heterogeneous waste streams or only a few. EPA's inspection scope is governed by a site's stated limits on the applicability of proposed waste characterization processes.

typically conducted using non-destructive assay is not applicable to Sealed Sources. Instead, the radiological characterization used to support the determination of the waste's status with respect to the 100 nCi/gram TRU criterion and derivation of values for the ten WIPP-tracked radionuclides are assigned on the basis of historical records, OSRP's radionuclide content estimation model, or other documentation for these sources. Accordingly, the scope of this inspection is limited to the techniques of AK and VE. The Sealed Sources currently in temporary storage at the Nevada Test Site were characterized and packaged by OSRP. LANL CCP will be responsible for characterizing and emplacing them at WIPP as TRU debris waste.

## 5.0 DEFINITIONS

*Finding:* A determination that a specific item or activity does not conform to 40 CFR 194.24(c)(4). A finding requires a response from the Carlsbad Field Office (CBFO).

*Concern:* A judgment that a specific item or activity may or may not have a negative effect on compliance and, depending on the magnitude of the issue, may or may not require a response.

## 6.0 INSPECTION TEAM

The members of the EPA waste characterization inspection team are identified below.

Inspection Team Member	Position	Affiliation
Rajani Joglekar	Inspection Team Leader	EPA HQ
Dorothy Gill	Inspector	S. Cohen & Associates, Inc.
Connie Walker	Inspector	S. Cohen & Associates, Inc.
James Channell	Inspector	S. Cohen & Associates, Inc.
Patrick Kelly	Inspector	S. Cohen & Associates, Inc.

## 7.0 PERFORMANCE OF THE INSPECTION

EPA Inspection No. EPA-LANL-CCP-OSRP-05.05-8 took place from April 11-15, 2005. The inspection involved two elements of LANL's CCP OSRP TRU waste characterization program: Acceptable Knowledge (AK) and Visual Examination (VE). These elements constitute a sampling of the "system of controls" for waste characterization that is identified in 40 CFR 194.24(c)(4).

EPA examined these two processes to determine whether LANL CCP OSRP demonstrated compliance with 40 CFR 194.24 for Sealed Sources. The checklist used by EPA inspectors for the AK evaluation is included in Attachment A. Due to the technical nature of the Sealed Sources, the elements of VE were not adapted into a checklist format, but the essence of the technical evaluation is provided in text form in Section 7.2.

LANL is located approximately 25 miles north of Santa Fe, New Mexico, and encompasses approximately 43 square miles. As described in AK documentation, the primary mission of LANL historically has been nuclear weapons research and development, and its current mission includes support of civilian defense and industrial clientele. Since the early 1950s, the federal government has made available radioactive materials for use in research in industrial and medical applications and for determining the biological effects from exposure to radioactive materials and ionizing radiation. This resulted in relatively widespread distribution of batches of materials containing actinide elements to selected manufacturers for production and distribution of Sealed Sources. Following the terrorist events of September 11, 2001, the actinide-bearing Sealed Sources were identified as a major security vulnerability. Consequently, the need to accelerate the recovery of “discarded” sources, and their proper management and disposal was recognized as a priority by the Departments of Energy and Homeland Security.

Sealed Sources cannot be readily characterized using existing technologies that are routinely applied to other CH TRU wastes. At the time of this inspection, the procedures and activities reviewed by EPA that were used to characterize Sealed Sources classified as CH newly-generated debris (S5000) TRU waste were AK and VE. Specifically, the wastes of interest were collected and packaged in TRU waste containers and characterized by OSRP before transferring them to LANL CCP for management, processing and disposal as TRU debris waste.

The OSRP was initiated to recover and manage unwanted, discarded radioactive Sealed Sources from the public and private sector. The definition of sealed source is “radioactive material that is contained in a sealed capsule, sealed between layers of non-radioactive material, or firmly fixed to a non-radioactive surface by electroplating or other means” (SSP-AK-LANL-008, Rev. 0). The primary radionuclide contributors to the waste stream are Pu-239, Pu-238 and Am-241, and the characterization of these sources is based on AK rather than NDA. The proposed characterization relies on two main aspects: (1) the use of AK to identify the isotopic distribution based on the primary radionuclide, i.e., to match an isotopic profile from a series of Material Types (MT) such as weapons grade (MT 52) or heat source (MT 83); and (2) assigning quantitative radionuclide values based on details of source construction and/or application as indicated in the AK documentation record. Estimates of the uncertainties associated with each MT were developed as well. Information used to determine these values had undergone Peer Review in October 2003 in accordance with NUREG 1298. The Peer Review Panel was convened to review the available AK data to determine if the data were adequate to support the determination of the radionuclide content for compliance with the WIPP waste acceptance criteria (WAC). This Peer Review Panel evaluated AK sealed source data, and concluded that “the various [AK] data records collected provide either uniquely or as a sum of several individual records, were adequate documentation for determining the radionuclide type, the radionuclide content/activity and either the date of manufacture or other more conservative date (for purposes of decay correction).”

The LANL Sealed Source program must meet specific AK documentation requirements as presented in the Waste Analysis Plan (WAP). Since the WAP was attached to the CCA and was considered a basic document that describes the WIPP waste characterization “system of controls”, some AK elements in the WAP are pertinent to sealed sources. They are as follows:

- The waste container contents meet the definition of Sealed Sources per 10 CFR §30.4 and 10 CFR §835.2 (effective January 1, 2004), evidence of which must be assembled as part of the AK documentation.
- The Sealed Sources must be U.S. Department of Transportation Special Form Class 7 (Radioactive) Material per 49 CFR §173.403 (effective October 1, 2003), the certification of which must be assembled as part of the AK documentation.
- The integrity of each Sealed Source must be validated by documented contamination survey results to meet the requirements of 10 CFR §34.27 21 (effective January 1, 2004), which must be assembled as part of the AK documentation.

The inspection was conducted in the following steps:

- (1) Developing lines of technical inquiry prior to the inspection, e.g., checklists;
- (2) Reviewing the results of EPA's and CBFO's prior inspections and audits of LANL and the results of the 2003 Peer Review Panel to identify potential areas of inquiry during inspection interviews;
- (3) Reviewing site procedures and other information and modifying EPA checklists, as necessary, to incorporate site-specific information; and
- (4) On-site verification of personnel training and the technical adequacy of procedures, and equipment through interviews and demonstrations.

The following subsections of this report address the results of EPA's inquiries into each technical area. The checklist attached to this report (Attachment A) identifies, as appropriate, key AK documents that the EPA inspection team reviewed, site personnel who were interviewed, and demonstrations that were performed pertinent to this inspection. The personnel interviewed are as follows:

**OSRP Characterization Personnel Contacted During Audit (AK and VE)**

<b>Personnel</b>	<b>Organization</b>	<b>Area of Expertise/Function</b>
Kevin Peters	Technical Specialists, Inc.	Acceptable Knowledge
Steve Shaffer	Technical Specialists, Inc.	Acceptable Knowledge
Randy Fitzgerald	Technical Specialists, Inc.	Acceptable Knowledge
Jene Vance	LANL OSRP	OSRP Program
Jerry McAlpin	LANL OSRP	OSRP Program
Alex Feldman	LANL OSRP	OSRP Program
Leroy Leonard	LANL OSRP	OSRP Program
Julia Whitworth	LANL OSRP	Acceptable Knowledge, Expert
Alex Feldman	LANL OSRP	Characterization
Mike Peterson	LANL OSRP	Team Leader OSRP
Shelby Leonard	LANL OSRP	Team Leader OSRP
Joe Franco	CCP OSRP	CCP OSRP Program Manager

Jerry McAlpin	LANL OSRP	VE Operator
Jim Matzke	LANL OSRP	Recovery Coordinator

## 7.1 Acceptable Knowledge (AK)

EPA examined the AK process and associated information to determine whether LANL CCP OSRP demonstrated compliance with §194.8 requirements for Sealed Sources waste at LANL. As part of the inspection, EPA reviewed the elements of the AK process listed below. Attachment A identifies the objective evidence reviewed by EPA:

- Overall procedural technical sufficiency and scope, and ability to follow the AK waste characterization process for containers and waste streams
- Waste-generating procedures, processes, and documentation
- Characterization of required waste material parameters and radionuclides
- AK information assembly and compilation
- AK confirmation and associated discrepancy resolution
- Sufficiency of AK characterization results
- Assembly of required information and use of supplemental information
- AK summary preparation
- Reassignment of waste stream due to AK and discrepancy analysis
- AK Accuracy

The characterization of sealed sources under the OSRP is performed using AK to determine several aspects of TRU wastes at LANL:

- Defense waste status,
- Radiological content,
- Material parameters,
- Waste stream, and
- Waste matrix codes.

During the inspection, EPA inspectors examined procedures and documents specific to the OSRP program, including the following:

- M031, P2010 Container Packaging and VE Data Records from OSRP, March 29, 2005
- M006, LA OS-00-01 NMMSS Report SS-2, From “Nuclear Material Management and Safeguards System” (Listing of Sealed Sources by RIS as of December 31, 1985)
- D008, Sealed Sources Peer Review Report, H. Evans, et al, December 5, 2003

- DR001, Discrepancy Resolution, Differences between NMMSS and Shipping Data for Seven LLNL Sealed Sources April 7, 2005
- CCP-TP-101, Off-Site Source Recovery Project Sealed Source radiological Characterization, Rev.0, March 17, 2005
- CCP-PO-001, Rev. 10, CCP Transuranic Waste Characterization Quality Assurance Project Plan, February 24, 2005
- CCP-PO-002, Rev. 11, CCP Transuranic Waste Certification Plan, February 24, 2005
- CCP-QP-002, Rev. 16, CCP Training and Qualification Plan, December 7, 2004
- P004, Recovery, Transport, and Storage of Off-Site Source Recovery Project Material September 30, 2004
- CCP AK LANL 008 Central Characterization Project Acceptable Knowledge Summary Report for Los Alamos National Laboratory Off-Site source recovery project Sealed Sources Waste Stream LA-OS-00-01.001, Rev. 0, March 3, 2005
- M025, Manufacturer's Data for LLNL sources LLNL-MRC-Pu-Be-\*-1, MRC Pube-8-7, MRCPuBe8-15,-9,-26-28) September 20, 2002
- M036, Calculation of Prevalent Radionuclides for the OSRP Waste Stream, J. Whitworth, October 26, 2004
- M032, Contamination Survey Forms, LANL, Various Authors, OSRP Stream, March 29, 2005
- M026, Pu-239/Be Sealed Source Supporting Documentation, LA-OS-00-01, various dimensional drawings, etc., March 28, 2005
- D012, Engineering Evaluation of New England Nuclear Model NER-478C Sealed Sources as Special Form Radioactive Material J. Thompkins, TWCP-05635, May 24, 2001
- C007, Memo and Supporting Documentation to L. Leonard re: Special Form Character of MRC-N-SS-W-AmBe Sealed Sources, November 3, 1999
- Draft Attachment 13, CCP AK Confirmation Checklist for LA-OS-00-01 (undated, provided during inspection)
- M005, Query of "Registry of Radioactive Sealed Sources and Devices" May 21, 1982
- D004, The Off Site Source Recovery Project at Los Alamos, January 1, 1999
- D005, Summary of Sealed Source Types, OSRP, S. Leonard, TWCP-03759, April 11, 2000
- Attachment 5, Hazardous Constituents, Off site Source Recover Project Sealed Sources (undated, provided during inspection)
- Attachment 6, Off-site Source Recovery Project Sealed Sources (undated, provided during inspection)
- Attachment 7, Radionuclides (undated, provided during inspection)

- LA-OS-00-01 Attachment 8 Waste Containers (undated, provided during inspection)
- Attachment 4, Acceptable Knowledge Source Document Reference List (undated, provided during inspection)
- Attachment 1, Acceptable Knowledge Documentation Checklist for Sealed Source Non-Hazardous Defense Debris Waste (undated, provided during inspection)
- M001, Spreadsheet of OSRP Defense Related Drums, J. McAlpin March 21, 2005 (sign off date)
- D007, Radiological Characterization of Actinide Sealed Source Waste for Disposal at WIPP, April 6, 2005
- C003, Memo to LANL TWCP Records Management re: Estimation of U-234 Resulting from Pu-238 Decay, March 2, 2005
- C004, Memos and Other Documentation Supporting Pu-239 Defense Relationship, September 8, 2003
- C002, Approval to Generate OSRP Waste with No Disposal Path, Letter to J. Browne from R. Glass, February 10, 2000
- C010, Evaluating the Radionuclide Characterization of the OSRP Waste from Waste Stream LA-OS-00-01, A. Feldman, J. Whitworth, April 7, 2005
- D012, Engineering Evaluation of New England Nuclear Model NER-478C Sealed Sources as Special Form Radioactive Material, J. Tompkins, May 24, 2001
- D001, Headspace Gas Sampling and Analysis Evaluation for LANL Sealed Sources, B. Humphreys, LANL, 2003
- M002, Batch Data Report Number LA02-HGSD/IA-006 for Headspace Gas Analysis to Determine OSRP Packaging Source Term, Laura Ortega, LANL, November 22, 2002
- P001, Visual Examination and Packaging of OSRP Sealed Sources, dated through July 15, 2002, LANL, J. McAlpin, OSRP-OP-120
- M037, OSRP Plutonium Weight Calculation, J Whitworth, January 10, 2005
- M007, Manufacturer Data from Mound Monsanto and GE Schenectady-Navy, Monsanto TWCP-06723, 1981
- CCP-AK-LANL-008 CCP AK Knowledge Summary Report for Los Alamos National Laboratory Off-Site Source Recovery Project Sealed Sources, Waste stream LA-)S-00-01.001, Rev. 1, April 13, 2005
- Attachment 13, CCP Acceptable Knowledge Confirmation Checklist for Sealed Sources LA-OS-00-01, (undated, acquired during audit) includes HSG data from permit
- AK Tracking Spread Sheet from Julia Whitworth, undated (example screen print out for Sealed Sources)
- Waste Stream Profile LA-OS-00-01.001-DRAFT, Preliminary Draft for Audit Purposes (provided during audit)

- SPM qualification Card for Joe Franco October 25, 2004
- AKE Qualification Card for Steve Schafer October 6, 2003
- AKE Qualification Card for Kevin Peters August 6, 2003

The following drums and associated data characterization packages were also examined:

Container ID	Characterization Data Package	VET Data Package
LA 00000061540 (Source ID: N1600K9)	LA05-OSRP-CH-001	LA05-OSRP-VE-001
LA00000061515 (Source ID M518)	LA05-OSRP-CH-002	LA05-OSRP-VE-002
LA00000064512 (Source ID N160A6)	LA05-OSRP-CH-003	LA05-OSRP-VE-003

The inspection team’s evaluation covered the following activities related to AK.

- (1) The AK OSRP Summary was adequately assembled and generally provided sufficient detail.

CCP-AK-LANL-008 Rev.0, the Sealed Source AK Summary Report, presented the results of AK data assembly and interpretation. This report, in general, was adequately assembled, although DOE and EPA technical personnel identified several elements that required revision. These are as follows:

- Provide a reference justifying the assigned waste matrix code of S5100
- Expand the waste material parameter section 5.4.1.2 to include a description of all materials
- Correct inaccurate references pertaining to Section 8 of the Summary Report
- The Summary Report contains two Attachment “T”s; the duplication should be rectified
- The Projected Waste Volume, Attachment 2, is dated and lacks adequate explanation

These corrections were made during the inspection and a revised AK Summary, CCP-AK-LANL-008 Rev. 1, was issued during the inspection.

It should be noted that the waste stream profile form (WSPF) includes a “Draft Summation of Aspects of the AK Summary Report: LA-OS-00-01.001”. Some sites attach the entire AK Summary to the WSPF, but in the case of CCP, only this summation document was attached. Evaluation of the AK Summary during the audit focused on CCP-AK-LANL-008 Rev.1 as this was identified as the AK Summary.

- (2) Overall procedural technical sufficiency and scope, and ability to follow the acceptable knowledge waste characterization process for containers and waste streams were evaluated.

The documentation reviewed provided the technical basis for establishing the isotopic distribution and the determination of radionuclide mass values with their associated uncertainty. The processes used to derive this information were described and the supporting calculations were presented in sufficient detail to allow the inspection team members to check all values and the technical correctness of the assumptions upon which they were based.

(3) Sealed Source Characterization Model of OSRP was described by the OSRP staff.

The following document was reviewed prior to the inspection to guide investigation and questions during the inspection:

CCP-TP-101, CCP *Sealed Source Radiological Characterization*, Revision 0

LANL provided a slide presentation demonstrating how the Sealed Sources were characterized and how the software used to calculate the characterization data was developed. Characterization data includes decay corrected values for the FGE, PE-Ci, decay heat, and activity for thirteen (13) radionuclides,  $^{241}\text{Am}$ ,  $^{137}\text{Cs}$ ,  $^{233}\text{U}$ ,  $^{234}\text{U}$ ,  $^{235}\text{U}$ ,  $^{238}\text{U}$ ,  $^{236}\text{Pu}$ ,  $^{238}\text{Pu}$ ,  $^{239}\text{Pu}$ ,  $^{240}\text{Pu}$ ,  $^{241}\text{Pu}$ ,  $^{242}\text{Pu}$ , and  $^{90}\text{Sr}$ , including uncertainty, as required. These values are used to ensure that the wastes meet the requirements of DOE-WIPP-02-3122 (WIPP Waste Acceptance Criteria) such that they are eligible for disposal at WIPP. The information used as the basis for characterization data is derived from a combination of the NMMSS database, established isotopic profiles, source manufacturers information and radioactive ingrowth and decay based on known physical constants.

Several aspects of the approach used by LANL CCP were arbitrary in the sense that a technical justification for an alternate approach could be made. For example, all the detected gamma photon activity above 350 keV was attributed to the energetic emissions of  $^{137}\text{Cs}$  because, as stated in AK Document D0007: *Fission product contamination was typically reported as total gamma activity with photon energies greater than 0.35 keV, which would exclude transuranic elements.* Technically, this is incorrect as there are many photon lines greater than 350 keV (*0.35 keV* is a typographical error) that are used to quantify Pu, Am and U radionuclides. An alternative method is to devise a means to allocate the observed gamma response among the various photons lines based on fission yields, the means of producing the principal radionuclides, e. g.,  $^{238}\text{Pu}$  and  $^{239}\text{Pu}$ , and decay kinetics. The actual difference between these alternate approaches would probably be small and would not be expected to make any difference with respect to the waste's classification. For the purposes of characterizing sealed sources one could justify OSRP's assumption because it provides a means to account for  $^{137}\text{Cs}$  and  $^{90}\text{Sr}$ , both of which are WIPP-tracked radionuclides that are absent on AK documents. Information is available for the other Pu, Am and U radionuclides and LANL's approach provides a conservative value for both  $^{137}\text{Cs}$  and  $^{90}\text{Sr}$ . In a more academic setting one might debate the merits of this approach but in the context of the WIPP waste characterization requirements this is not incorrect.

(4) Waste generating procedures, processes and documentation were examined as presented in the AK Summary and supporting documentation.

Review of the AK Summary LA-OS-00.01 Rev.1 showed that Sealed Sources are relatively unique among wastes intended for shipment to WIPP in that based on the information reviewed each source has at least a partial, if not complete, pedigree with respect to knowledge of the source generation location, date, transfer history, etc. Data are traceable for each source through various databases and documents (References M031), and each radiological Batch Data Report (BDR) contains this original source documentation since characterization is based on AK rather than NDA. Also, the CCP representative stated that when a source does not have the appropriate pedigree, including a definitive determination of defense status, meeting the definition of special form, etc., (Reference M001), that an NCR is issued for that waste and is not shipped to WIPP until outstanding issues are resolved. References were examined that showed compliance with WAC requirements (M036, Calculation of the Prevalent Nuclides in the OSRP Waste Stream). Because the waste is not retrievably-stored but rather is recovered from off-site facilities, additional "waste generating" process required evaluation, including the waste retrieval and on-site visual verification/documentation activities (see Section 7.2 of this report, reference D004).

(5) Characterization of required waste material parameters and radionuclides.

The activity of the primary radionuclide in each recovered Sealed Source is determined on the basis of information such as the NMMSS database, source certificates, shipping records and source fabrication documents. Serial numbers are usually present and legible on Sealed Sources. Secondary information such as source markings, NRC registry information, manufacturer sales brochures and sealed source design drawings may also be used, when necessary. Measurements of external gamma and/or neutron fields are made in the field or at the site of assembly prior to placing a source in a special form capsule which in turn is placed in a pipe overpack container (POC) which is placed in a 55 gallon (208 liter) drum as the final waste container configuration.

(6) AK information assembly, compilation, and verification were evaluated, including the adequacy and content of supplemental information.

The site included appropriately compiled and assembled supplemental and mandatory information pertaining to the Sealed Sources. For example, the site assembled summary information pertaining to the categories and types of sources, including manufacturer's drawings. Supplemental information assembled also included manufacturer's data for various facilities/companies (Mound Monsanto, Reference M007), as well as historic batch analytical data (Reference M026) used to develop the representative isotopic distributions applied to each source type. Defense determinations for each source are made and documented (Reference C004, Memos and Other Documentation Supporting Pu-239 Defense Relationship). Current and historic databases were queried (Reference M005, which addresses the Registry of Radioactive Sealed Sources and Devices (RRSSD), 1982; and, Reference M006, NMMSS Report SS-2).

The Peer Review Panel identified and prioritized the available types of documentation with respect to AK, i.e., that source certificates provided relevant information such as isotopics, SNM mass content, and date(s) of activity determination to facilitate ingrowth and decay calculations. Other source documents such as NSSDR information provided less of this information. The OSRP attempted to assemble and use information as specified by the

Peer Review Panel. Also, several requirements related to the documentation of AK are presented in the WAP, including:

- The waste container contents meet the definition of Sealed Sources per 10 CFR §30.4 and 10 CFR §835.2 (effective January 1, 2004), evidence of which must be assembled as part of the AK documentation.
- The Sealed Sources must be U.S. Department of Transportation Special Form Class 7 (Radioactive) Material per 49 CFR §173.403 (effective October 1, 2003), the certification of which must be assembled as part of the AK documentation.
- The integrity of each sealed source must be validated by documented contamination survey results to meet the requirements of 10 CFR §34.27 21 (effective January 1, 2004), which must be assembled as part of the AK documentation.

All of the above WAP information requirements were assembled and included in the AK record (Reference M032, Contamination Survey Forms; Reference D012, Evaluation of Sealed Sources Special Form Material, etc). If required data were not available for a particular source, CCP would issue an NCR and the source would not be eligible for shipment to WIPP until the issue was resolved.

(7) AK confirmation and associated discrepancy resolution were evaluated.

A draft CCP Acceptable Knowledge Confirmation Checklist was provided for Waste Stream Number LA-OS-00-01 that demonstrated CCP's ability to complete the form for this waste stream. A sample discrepancy report, Reference DR001 was also provided for review. CCP also provided example references (Reference M025) that addressed, for example, how discrepancies between the original manufacturer's source certification and NMMSS record were resolved and document. Adequate examples of objective evidence were provided that showed that confirmation and discrepancy resolution were sufficiently performed. A draft WSPF was also provided to EPA, but it did not include the Characterization Information Summary (CIS) that is attached to a completed WSPF. This time EPA did not examine the CIS for Sealed Sources because it did not include radiological information. The CCP AK Confirmation Checklist however, included a radiological data summary. In the future, EPA expects to see completed CIS with each WSPF for examination during inspection. Further, the SPM data validation summary checklist items 17 - 23 address various requirements that must be met for Sealed Sources, but the references within these sections are not precise enough to clearly illustrate how the SPM made the cited determination. To improve traceability, specific citations to the relevant AK source documents as well as BDR page numbers for supporting attachments should be included in this documentation. Also, AK Attachment 8 projected volume for this stream should provide a reference to the source of the information.

(8) Sufficiency of AK characterization results was examined.

As discussed previously, the approach taken to provide characterization with respect to the radionuclide content of the Sealed Sources relies entirely on AK, so this is not the typical *characterization* process routinely encountered at TRU generator sites. Based on the

nature and history of the sources and the documentation presented and evaluated during this inspection, the characterization process is acceptable for Sealed Sources characterized under the OSRP. The quality and extent of the radionuclide related information provided under the OSRP are adequate to support the characterization approach used by LANL CCP.

(9) AK Accuracy was evaluated.

The proposed process relies upon AK to characterize this Sealed Sources waste stream. Therefore, AK Accuracy Calculations cannot be made because neither NDA nor DA measurements will be collected to compare against the AK characterization results.

EPA concluded that the use of AK to characterize Sealed Sources was adequately demonstrated.

### **Findings**

The EPA inspection team did not identify any findings related to AK.

### **Concerns**

The EPA inspection team identified one (1) AK concern. No response to this concern is required at this time.

***AK Concern Number 1.*** The comment column of SPM DV Summary for the OSRP should reference specific locations in the BDR, AK Summary, or other AK references that provide the information specific to the sources addressed in the BDR. As written, reference is made only to “data sheet and AK information”, which is not sufficiently specific. No response to this concern is required at this time.

## **7.2 Visual Examination (VE)**

During the inspection, EPA observed a demonstration of the packaging and VE process used for Sealed Sources contained in a special form capsule, reviewed training records for OSRP personnel, and VE and characterization Batch Data Reports. As stated previously, the nature of the Sealed Sources is such that the technical evaluation of VE was performed without the use of a separate formal checklist. However, the same technical areas were addressed and are contained in the text of this section.

### **Source Packaging and VE**

The following documents were reviewed prior to or during the inspection:

- CCP-TP-069, *CCP Sealed Source Visual Examination and Packaging*, Revision 1
- Completed Attachment 4 for container LA00000061516

LANL demonstrated the process used to package several sources into a stainless steel, special form capsule which, after sealing, becomes the new source for disposal, as discussed in Section 4. In the field, up to 100g of material may be packaged in a capsule, representing several discrete sources.

- A minimum of two operators is involved in the VE and packaging operation. Data are entered into electronic forms (Attachment 4, CCP-TP-069).
- Any data entered into the electronic form are checked by the second operator.
- 55-gallon drum and POC filter model, serial number and manufacture date are recorded.
- For each source loaded into the POC, the operator performs VE and records the required data in Attachment 4:
  - source description and identifier
  - Waste Material Parameter (WMP)
  - estimated weight (Attachment 2, CCP-TP-069)
  - outer casing is made of non-VOC bearing material
  - source is not or is not contained in a rigid sealed container equal to or greater than 4 liters
  - items match waste stream description, waste matrix code and summary category group
  - there are no more than two (2) layers of confinement
- The presence or absence of prohibited items is recorded in Attachment 4, page 3.
- If a special form capsule is used, the lid is screwed on and the lug on the lid is removed. This results in a configuration that can only be opened by destroying the special form capsule.
- After emplacement of the source(s), the container is closed using a calibrated torque wrench; the POC bolts are torqued to 65 ft-lbs and the drum lid to 40 ft-lbs.
- A plastic TID is secured to the POC bolts and another is placed on the outside of the drum (this is a DOT requirement).
- Shipping of the drum is coordinated between the shipper (LANL) and the recovery site.
- If sources need to be consolidated between recovery sites, a 6M with 2R pipe container is used.

Documentation reviewed

A. Three (3) VE BDRs were reviewed to verify completeness of the documentation.

<b>VE Batch Data Reports Reviewed</b>
LA05-OSRP-VE-001
LA05-OSRP-VE-002
LA05-OSRP-VE-003

These BDRs were complete and contained all the required review checklists.

The following characterization BDRs were reviewed to verify that the characterization data were complete and the required reviews were performed.

Characterization Batch Data Reports Reviewed
LA05-OSRP-CH-001
LA05-OSRP-CH-002
LA05-OSRP-CH-003

These BDRs were complete and contained all the required review checklists.

C. Training records for OSRP personnel were reviewed on-site.

Training Records Reviewed for OSRP Personnel
Qualification Card, VE operator/ITR/TS/FQAO, Jerry McAlpin
Qualification Card, VE operator/ITR/TS/FQAO, Alex Feldman
Qualification Card, VE operator/ITR/TS/FQAO, Michael Lindstrom
Qualification Card, Operator/ITR/TS/FQAO, OSRP Operator/Team Leader, Jerry McAlpin
Qualification Card, Operator/ITR/TS/FQAO, OSRP Operator/Team Leader, Alex Feldman
Qualification Card, Operator/ITR/TS/FQAO, OSRP Operator/Team Leader, Julia Whitworth

Training documentation was complete and filed correctly for viewing and reference.

The objective evidence reviewed for this inspection is as follows:

Objective Evidence Reviewed
BDR LA05-OSRP-VE-001
BDR LA05-OSRP-VE-002
BDR LA05-OSRP-VE-003
BDR LA05-OSRP-CH-001
BDR LA05-OSRP-CH-002
BDR LA05-OSRP-CH-003
Qualification Card, Operator/ITR/TS/FQAO, OSRP Operator/Team Leader, Alex Feldman
Qualification Card, Operator/ITR/TS/FQAO, OSRP Operator/Team Leader, Julia Whitworth
Qualification Card, Operator/ITR/TS/FQAO, OSRP Operator/Team Leader, Jerry McAlpin
Qualification Card, VE operator/ITR/TS/FQAO, Michael Lindstrom
Qualification Card, VE operator/ITR/TS/FQAO, Alex Feldman
Qualification Card, VE operator/ITR/TS/FQAO, Jerry McAlpin
Attachment 4 for container LA00000061516

**Findings**

The EPA inspection team did not identify any findings related to VE.

**Concerns**

The EPA inspection team did not identify any concerns related to VE.

## 8.0 RESPONSE TO COMMENTS

EPA did not receive comments in Docket A-98-49 related to this inspection.

## 9.0 SUMMARY OF RESULTS

### 9.1 Findings

The EPA inspection team did not identify any findings related to AK or VE.

### 9.2 Concerns

The EPA inspection team identified one (1) concern in the area of AK. No response to this concern is required at this time.

**AK Concern No. 1.** The comment column of SPM DV Summary for the OSRP should reference specific locations in the BDR, AK Summary, or other AK references that provide the information specific to the sources addressed in the BDR. As written, reference is made only to “data sheet and AK information”, which is not sufficiently specific. No response to this concern is required at this time.

### 9.3 Conclusions

EPA’s independent inspection of personnel, procedures and equipment under the OSRP as implemented by LANL CCP has led EPA to conclude that the LANL-CCP OSRP waste characterization program meets the technical requirements of §194.24(c) regarding the characterization systems and processes in use for the OSRP as listed below:

Acceptable Knowledge (AK) — EPA concluded that the elements of the LANL-CCP OSRP AK waste characterization processes that the inspection team examined are technically adequate.

Visual Examination (VE) — EPA concluded that the elements of the LANL-CCP OSRP VE program examined during the inspection were technically adequate with respect to the assignment of Waste Material Parameters.

The EPA inspection team determined that the waste characterization processes of AK and VE that are implemented by the LANL-CCP OSRP and were evaluated during this inspection can adequately characterize CH newly-generated transuranic debris waste (S5000) in accordance with 40 CFR 194.24(c)(4).

The Table below provides a summary of EPA’s approvals of the LANL CCP’s CH TRU waste characterization processes.

### Summary of EPA Approvals

Waste Characterization Element	OSRP Sealed Sources	Debris Waste	Solid Waste
Acceptable Knowledge	Approved - June 2005	Approved - August 2004	Approved - August 2004
Nondestructive Assay	Not Applicable	Approved - August 2004: - HENC - PTGS/FRAM System 1 and 3	Approved - August 2004: - HENC - PTGS/FRAM System 1 and 3
Nondestructive Examination	Approved (VE only) - June 2005	Approved (VE and RTR) - August 2004	Approved (VE and RTR) - August 2004
WIPP Waste Information System	Approved - June 2005	Approved - August 2004	Approved - August 2004
Load Management	Not approved	Approved - June 2005	Not approved

**ATTACHMENT A**

**Attachment A. Acceptance Knowledge (AK) Checklist**

Establishment of Required Technical Elements in Procedures	Y/N Location	Execution of Procedures	Y/N	Objective Evidence/Comment
<p>Procedures require staff to be:</p> <ul style="list-style-type: none"> <li>• Familiar with applicable technical procedures</li> <li>• Familiar with QAOs</li> <li>• Qualified to assemble, compile, and confirm AK data</li> </ul>	<p>CCP-TP-005 Rev. 14; CCP-QP-002, Rev. 16</p>	<p>Employee's explanation of job duties was consistent with applicable procedures Employee could identify the mandatory AK items for assembly Employee's identification of applicable procedures was correct Employee adequately explained how to assemble, compile, and confirm data Employees responsible for AK documentation were trained and qualified in accordance with applicable procedures</p>	<p>Y</p>	<p>Examined the training records for Joe Franco, Steve Shaffer, and Kevin Peters. Did not examine training records for site personnel (LANL, not with CCP) involved with the program. Individuals interviewed and individuals whose training records were examined understood their job duties and were knowledgeable of the AK process and procedures. There were a few communication issues associated with sharing of information between LANL and CCP, but these were not due to personnel related issues observed during the inspection.</p>
<p>Procedures demonstrate a logical progression from general facility information to more detailed waste stream-specific information</p>	<p>CCP-TP-005 Rev. 14</p>	<p>This logical sequence can be demonstrated through traceability analysis. (Traceability analysis and linkages may include, but need not be limited to, individual container data for radionuclides and waste material parameters, IDCs, and waste streams.)  AK documentation is traceable to the drum level</p>	<p>Y</p>	<p>M031, D008, CCP AK LANL 008, M036, P004, M026, M005, M001, P001, AK Tracking Spread Sheet from Julia Whitworth, CCP 05 Attachment 8, Waste Stream Profile LA-OS-00-01.001-DRAFT. BDRs: LA05-OSRP-CH-001, LA05-OSRP-CH-002, LA05-OSRP-CH-003, LA05-OSRP-VE-001, LA05-OSRP-VE-002, LA05-OSRP-VE-003. Data were traceable through original sealed source databases (NMMSS, etc). There was some difficulty with respect to communication of information between LANL and CCP staff with respect to completed characterization status; implementation of the PTS/CTS shall purportedly alleviate this issue.</p>
<p>Procedures for AK processes are consistent with each other</p>	<p>CCP-TP-005 Rev. 14; CCP-PO-002, Rev. 11; CCP-PO-001 Rev 10</p>	<p>Procedures for AK processes are implemented consistently</p>	<p>Y</p>	<p>CCP-TP-005 is consistently implemented at all CCP sites; use of this procedure in conjunction with the already implemented OSRP program appeared satisfactory.</p>
<p>The site's TRU waste management program has procedures to determine:</p> <ul style="list-style-type: none"> <li>• Waste categorization schemes (e.g., consistent definitions of waste streams) and terminology</li> </ul>	<p>CCP-TP-005 Rev. 14</p>		<p>Y, in part</p>	<p>M031, D008, P004, CCP AK LANL 008, M036, C007, M005, D005, Attachment 6, Attachment 7, LA-OS-00-01 Attachment 8 Waste Containers, M001, C010, AK Tracking Spread Sheet from Julia Whitworth. Waste</p>

**Attachment A. Acceptable Knowledge (AK) Checklist**

Establishment of Required Technical Elements in Procedures	Y/N Location	Execution of Procedures	Y/N	Objective Evidence/Comment
<ul style="list-style-type: none"> <li>Breakdown of the types and quantities of TRU waste generated/stored at the site</li> <li>How waste is tracked and managed at the generator site (including historical and current operations)</li> </ul>				categorization appears appropriate. Site also determined defense status on an individual source basis, and tracked the status on a source basis. Approximately 1.5 individual sources were to be emplaced in each drum. The definition of waste stream appears to be consistently and adequately applied in this instance. Site must ensure that adequate communication between the OSRP and CCP is implemented so that errors do not occur with respect to inappropriate shipment of sources, as the program deals with many sources that are not eligible for shipment to WIPP.
Procedures call for AK information to be collected for:  <sup>241</sup> Am, <sup>238</sup> Pu, <sup>239</sup> Pu, <sup>240</sup> Pu, <sup>242</sup> Pu, <sup>233</sup> U, <sup>234</sup> U, <sup>238</sup> U, <sup>90</sup> Sr, <sup>137</sup> Cs + unexpected radionuclides ferrous metals (in containers) cellulose, plastics, rubber nonferrous metals (in containers)	CCP-TP-005 Rev. 14; CCP-PO-002, Rev. 11; CCP-PO-001 Rev 10; CCP-TP-101	AK information is collected for:  <sup>241</sup> Am, <sup>238</sup> Pu, <sup>239</sup> Pu, <sup>240</sup> Pu, <sup>242</sup> Pu, <sup>233</sup> U, <sup>234</sup> U, <sup>238</sup> U, <sup>90</sup> Sr, <sup>137</sup> Cs + unexpected radionuclides ferrous metals (in containers) cellulose, plastics, rubber nonferrous metals (in containers)  Specify isotopes/quantities defined by AK  <ul style="list-style-type: none"> <li>Must be appropriate and result in unbiased values for cumulative activity and mass of radionuclides</li> </ul> Is AK information collected for isotopes?	Y	M031, M006, CCP AK LANL 008 Rev. 0 & 1; M025, M036, M026, M005, D004, D005, D007, C003, C010, P001 & M037  Specifically, documents M0009, M010, D0007 provide information regarding the derivation of isotopic distribution & quantities for <sup>241</sup> Am, <sup>238</sup> Pu, <sup>239</sup> Pu, <sup>240</sup> Pu, <sup>242</sup> Pu, <sup>233</sup> U, <sup>234</sup> U, <sup>238</sup> U, <sup>90</sup> Sr and <sup>137</sup> Cs based on documentation related to the primary radionuclide of each sealed source. For these wastes AK represents the totality of available radionuclide information since NDA is not performed.
Procedures require documentation of radionuclide process origin	CCP-TP-005 Rev. 14; CCP-TP-101 Rev 0	Identified radionuclides and their isotopic distributions are consistent and accurate	Y	M031, M006, CCP AK LANL 008 Rev. 0 & 1; M025, M026, D012, C007, M005, D005, C004, D012 & C010. Specifically, documents M0009, M010, D0007 provide information regarding the derivation of isotopic distribution & quantities for <sup>241</sup> Am, <sup>238</sup> Pu, <sup>239</sup> Pu, <sup>240</sup> Pu, <sup>242</sup> Pu, <sup>233</sup> U, <sup>234</sup> U, <sup>238</sup> U, <sup>90</sup> Sr and <sup>137</sup> Cs.

**Attachment A. Acceptable Knowledge (AK) Checklist**

Establishment of Required Technical Elements in Procedures	Y/N Location	Execution of Procedures	Y/N	Objective Evidence/Comment
	CCP-TP-005 Rev. 14; CCP-TP-101 Rev 0	<p>Radionuclides identified by AK and isotopic distributions are provided to NDA/Radioassay personnel.</p> <p>If AK data are provided to NDA personnel, data are available to operators prior to determination of isotopic quantities. Data use and limitations are well defined (refer to NDA checklist).</p>	Y	CCP-TP-005 Attachment 7 with AK-NDA Memo; M031, M006, CCP AK LANL 008 Rev. 0 & 1; M025, M026, D012, C007, M005, D005, C004, D012 & C010. Radiological characterization of the waste is done entirely through acceptable knowledge, so sharing of information between AK data assemblers and those performing characterization is imperative. This appears adequate through the sharing of memos and information about processes associated with assigning radionuclide values to each sealed source based on AK.
<p>Procedures require:</p> <p><u>Assembling</u> AK information</p> <p><u>Compiling</u> AK documentation into an auditable record (the process should include review of AK information to determine the waste material parameters and radionuclides present, as well as source info discrepancy resolution)</p> <p><u>Assigning</u> waste streams/waste matrix codes</p> <p><u>Identifying</u> physical forms, waste material parameters, and radionuclides (including, if possible, isotopic ratios)</p> <p><u>Resolving</u> data discrepancies</p> <p><u>Identifying</u> management controls for discrepant items/containers/waste streams.</p> <p><u>Confirming</u> AK information with other analytical results (done by comparing AK characterization data with that obtained through NDE and/or visual examination, including discrepancy resolution)</p> <p><u>Auditing</u> of AK records.</p>	CCP-TP-005 Rev. 14	<p>Compilation of AK documentation is adequately demonstrated</p> <p><u>From CH WAC:</u> If AK data discrepancy is identified, site will evaluate the source of the discrepancy to determine if discrepant information is credible. Information that is not credible will be identified as such and reasons for dismissing will be justified in writing. Limitations concerning information will be documented in the AK record and summarized in the AK report. If a discrepancy cannot be resolved, the site will perform direct measurements for the impacted population.</p> <p>Discrepancies are adequately resolved</p>	Y, in part	DR001, CCP-TP-005 Attachment 7 with AK-NDA Memo; M031, M006, CCP AK LANL 008 Rev. 0 & 1; M025, M026, D012, C007, M005, D005, C004, C010, D008, P004, M036, C007, Attachment 6, LA-OS-00-01 Attachment 8 Waste Containers, M001, C010, AK Tracking Spread Sheet from Julia Whitworth; Draft Attachment 13, CCP AK Confirmation Checklist for LA-OS-00-01. Site OSRP personnel have done a good job assembling AK information and compiling that information to ensure that all of the required data are assembled prior to shipment. The waste stream has been assigned appropriately, and data discrepancies are resolved when identified. Confirmation of AK cannot be accomplished through measurement because initial characterization is performed solely through AK. The comment column of SPM DV Summary for the OSRP should reference specific locations in the BDR, AK Summary, or other AK references that provide the information specific to the sources addressed in the BDR. As written, reference is made only to "data sheet and AK information", which is not sufficiently specific.

**Attachment A. Acceptable Knowledge (AK) Checklist**

Establishment of Required Technical Elements in Procedures	Y/N Location	Execution of Procedures	Y/N	Objective Evidence/Comment
<p>From CH WAC</p> <p>1. If AK was used (i.e., data collected prior to QA program), what method was employed to qualify the information? Approved methods or peer review, corroborating data, confirmatory testing, and QA program equivalency?</p> <p>2. At a minimum, to confirm existing AK data, it is necessary to compare ratios of the two most prevalent radionuclides in the isotopic mix</p>	<p>CCP-TP-005 Rev. 14; CH-WAC; CCP-PO-002, Rev. 11; CCP-PO-001 Rev 10; CCP-TP-101; CH-WAC</p>	<p>AK confirmation based on NDE and/or visual examination is adequately demonstrated. From the CH-WAC:</p> <p>1. <math>^{238}\text{Pu}</math>, <math>^{239}\text{Pu}</math>, <math>^{240}\text{Pu}</math>, <math>^{241}\text{Pu}</math>, <math>^{242}\text{Pu}</math> and <math>^{241}\text{Am}</math>:</p> <ul style="list-style-type: none"> <li>- Confirmation can be accomplished via comparison of measured and AK values for <math>^{239}\text{Pu}/^{240}\text{Pu}</math> for weapons grade plutonium; <math>^{238}\text{Pu}/^{239}\text{Pu}</math> for heat source</li> <li>- Measured <math>^{241}\text{Am}</math> can be used to calculate <math>^{241}\text{Pu}</math> (for subsequent AK comparison) if time of chemical separation is known (no <math>^{241}\text{Am}</math> at time of separation assumed)</li> <li>- <math>^{241}\text{Pu}</math> can be compared (by ratio) to confirm AK of any Pu isotope associated with WG/RG (i.e., <math>^{239}\text{Pu}</math> or <math>^{240}\text{Pu}</math>)</li> <li>- <math>^{238}\text{Pu}</math> from AK for WG or HS Pu isotopics is assumed to be valid if the AK values of <math>^{239}\text{Pu}</math> and <math>^{240}\text{Pu}</math> have been confirmed by measurement</li> <li>- <math>^{242}\text{Pu}</math> calculated by correlation techniques, since it can't be measured</li> </ul> <p>2. <math>^{235}\text{U}</math>, <math>^{233}\text{U}</math>, <math>^{238}\text{U}</math>, <math>^{234}\text{U}</math></p> <ul style="list-style-type: none"> <li>- Were they tracked or measured in AK information?</li> <li>- If no valid AK exists, data generated can only be used to detect or calculate, or confirm absence - ratios for <math>^{234}\text{U}</math> calculated from <math>^{235}\text{U}</math> enrichment</li> <li>- If valid AK exists can confirm with certified systems</li> <li>- <math>^{234}\text{U}</math> calculated by <math>^{235}\text{U}</math> enrichment, because <math>^{234}\text{U}</math> can't be measured</li> </ul> <p>3. <math>^{137}\text{Cs}</math> and <math>^{90}\text{Sr}</math></p> <ul style="list-style-type: none"> <li>- Confirmed by WIPP-certified system (direct measurement or comparison of <math>^{241}\text{Am}</math> peak at 662 keV to other <math>^{241}\text{Am}</math> peaks (disproportionate <math>^{241}\text{Am}</math> peak at 662 keV could mean presence of <math>^{137}\text{Cs}</math>)</li> <li>- <math>^{90}\text{Sr}</math> calculated from <math>^{137}\text{Cs}</math> using scaling factors</li> </ul>	<p>Y</p>	<p>D008, CCP-TP-005 Attachment 7 with AK-NDA memo; M031, M006, CCP AK LANL 008 Rev. 0 &amp; 1; M025, M026, D012, C007, M005, D005, C004, D012 &amp; C010.</p> <p>AK data for each sealed source was examined and qualified by Peer Review, as per NUREG-1298; the Peer Review panel determined which specific pieces of AK data provided acceptable information. Representative radionuclide distributions for different sources were developed based on AK information, supported by historic measurement data in some instances. The two most prevalent radionuclides were identified.</p> <p>Confirmation of AK is not applicable to these wastes since AK represents the entire basis for their characterization.</p> <p>Isotopics based on material types (MT) profiles for <math>^{239}\text{Pu}</math> and <math>^{238}\text{Pu}</math> bearing materials that were developed at LANL were assumed based on NMSS records and/or manufacturing information that provide data which were evaluated to tie material with a specific MT. Once a source could be identified with respect to MT, isotopic information was developed.</p> <p>Methods for deriving <math>^{137}\text{Cs}</math> and <math>^{90}\text{Sr}</math> values are presented based on the assumption that all direct gamma &gt; 350 keV are attributable to <math>^{137}\text{Cs}</math>.</p> <p>Uranium values are based on assuming that all uranium impurities are DU and calculating contributions for <math>^{235}\text{U}</math>, <math>^{238}\text{U}</math> &amp; <math>^{234}\text{U}</math>. <math>^{233}\text{U}</math> is assumed to be absent based on documentation related to production/purification of primary radionuclide(s).</p> <p>Requirements related to measurement systems do not apply to these wastes.</p>

**Attachment A. Acceptable Knowledge (AK) Checklist**

Establishment of Required Technical Elements in Procedures	Y/N Location	Execution of Procedures	Y/N	Objective Evidence/Comment
		4. Other radionuclides – must identify via NDA and should identify via AK		
<p>Procedures require that:</p> <p>AK information must be compiled in an auditable record, including a road map for all applicable information.</p> <p>A reference list must be provided that identifies documents, databases, Quality Assurance protocols, and other sources of information that support AK information.</p> <p>The overview of the facility and TRU waste management operations in the context of the facility's mission must be correlated to specific waste stream information.</p> <p>Correlations between waste streams, with regard to time of generation, waste generating processes, and site-specific facilities be clearly described. For newly generated wastes, the rate and quantity of waste to be generated shall be defined.</p> <p>Nonconforming waste must be segregated.</p>	CCP-TP-005 Rev. 14	<p>AK information is compiled in an auditable record, including a road map for all applicable information.</p> <p>A reference list is provided that identifies documents, databases, Quality Assurance protocols, and other sources of information that support AK information.</p> <p>The overview of the facility and TRU waste management operations in the context of the facility's mission is correlated to specific waste stream information.</p> <p>Correlations between waste streams, with regard to time of generation, waste generating processes, and site-specific facilities are clearly described. For newly generated wastes, the rate and quantity of waste to be generated are defined.</p> <p>Nonconforming waste is segregated.</p>	Y	M001, Attachments 1 and 4 from CCP-TP-005; Draft Attachment 13, CCP AK Confirmation Checklist for LA-OS-00-01. Waste stream is newly generated. Modifications to the AK summary to better present the dates of waste generation were required and were accomplished during the inspection. If required data were not available for a particular source, NCRs would be issued and the source would not be eligible for shipment to WIPP until the issue was resolved.

**Attachment A. Acceptable Knowledge (AK) Checklist**

Establishment of Required Technical Elements in Procedures	Y/N Location	Execution of Procedures	Y/N	Objective Evidence/Comment
<p>Procedures require that the following information will be included in the AK record:</p> <p>Map of the site that identifies the areas and facilities involved in TRU waste generation, treatment, and storage</p> <p>Facility mission description related to TRU waste generation and management</p> <p>Description of the operations that generate TRU waste at the site and process information, including:</p> <ul style="list-style-type: none"> <li>- Area(s) or building(s) from which the waste stream was or is generated</li> <li>- Estimated waste stream volume and time period of generation</li> <li>- Waste generating process description for each building or area</li> <li>- Process flow diagrams, if appropriate</li> <li>- Generalized material inputs or other information that identifies the radionuclide content of the waste stream and the physical waste form</li> <li>- Types and quantities of TRU waste generated, including historical generation through future projections</li> </ul> <p>From CH WAC</p> <ul style="list-style-type: none"> <li>• Waste identification/categorization schemes relevant to the isotopic composition of waste and description of isotopic composition of each waste stream</li> <li>• Physical/chemical waste composition that could affect isotopic distribution (i.e., processes to remove ingrown <sup>241</sup>Am)</li> <li>• Statement of all numerical adjustments applied to derive the material's isotopic distribution, e.g., scaling factors, decay/ingrowth corrections and secular equilibrium considerations</li> </ul>	<p>MP-TRUW-8.13, Rev. 10; CCP-PO-001 Rev 10; CCP-TP-101; CH-WAC</p>	<p>The following information is in the AK record:</p> <p>Map of the site that identifies the areas and facilities involved in TRU waste generation, treatment, and storage</p> <p>Facility mission description related to TRU waste generation and management</p> <p>Description of the operations that generate TRU waste at the site and process information, including:</p> <p>Area(s) or building(s) from which the waste stream was or is generated</p> <p>Estimated waste stream volume and time period of generation</p> <p>Waste-generating process description for each building or area</p> <p>Process flow diagrams, if appropriate</p> <p>Generalized material inputs or other information that identifies the radionuclide content of the waste stream and the physical waste form</p> <p>Types and quantities of TRU waste generated, including historical generation through future projections</p> <p>From CH WAC</p> <ul style="list-style-type: none"> <li>• Waste identification/categorization schemes relevant to the isotopic composition of waste and description of isotopic composition of each waste stream</li> <li>• Physical/chemical waste composition that could affect isotopic distribution (i.e., processes to remove ingrown <sup>241</sup>Am)</li> <li>• Statement of all numerical adjustments applied to derive the material's isotopic distribution, e.g., scaling factors, decay/ingrowth corrections, and secular equilibrium considerations</li> </ul>		<p>M025, M026, D012, D004, D005, M001, D007, C003, M031, M006, CCP AK LANL 008 Rev. 0 &amp; 1; M025, M026, D012, C007, M005, D005, C004, D012, C010; CCP AK LANL 008 Rev. 0 &amp; 1; Draft WSPF, M037, M001. Review of the AK Summary LA-OS-00.01 Rev.1 showed that Sealed Sources are relatively unique among wastes intended for shipment to WIPP in that each source appears to have at least a partial if not complete pedigree with respect to source generation location, date, transfer history, etc. Because the waste is newly generated, there are additional "waste generating" processes requiring evaluation, including waste retrieval and on-site visual verification &amp; documentation activities (see reference D004).</p> <p>Isotopic distributions are based on the MT profiles obtained from LANL documents which are tied to a specific source based on information from the NMSS database, production information from ORNL or other information. Values obtained for radionuclide masses are corrected for isotopics to yield radionuclide-specific concentrations for WIPP-tracked radionuclides.</p> <p>Scaling factors for <sup>137</sup>Cs and <sup>90</sup>Sr are identified and applied based on a conservative application of external gamma measurements. <sup>241</sup>Am is addressed in the same manner as other Pu isotopes and is corrected for decay and ingrowth. <sup>234</sup>U ingrowth based on <sup>238</sup>Pu is calculated. All ingrowth &amp; decay calculations are based on an assumed 25 or 40 year period, depending.</p> <p>No other radionuclides are present that would contribute to 95% of the radiological hazard</p>

**Attachment A. Acceptable Knowledge (AK) Checklist**

Establishment of Required Technical Elements in Procedures	Y/N Location	Execution of Procedures	Y/N	Objective Evidence/Comment
<ul style="list-style-type: none"> <li>Specification of isotopic ratios for the 10 WIPP-tracked radionuclides and, if applicable, the radionuclides that comprise 95% of the hazard</li> </ul>		<ul style="list-style-type: none"> <li>Specification of isotopic ratios for the 10 WIPP-tracked radionuclides and, if applicable, the radionuclides that comprise 95% of the hazard</li> </ul>		
<p>Site documents/procedures require the facility prepare an AK summary document that summarizes all information collected, including the basis for all waste stream designations.</p>	<p>CCP-TP-005 Rev. 14</p>	<p>The AK summary is available for EPA review and contains the required information, including the basis for all waste stream designations.</p>	<p>Y</p>	<p>CCP AK LANL 008 Rev. 0 &amp; 1. CCP-AK-LANL-008 Rev. 0, the Sealed Source AK Summary Report, presented the results of AK data assembly and interpretation. In general this report was adequately assembled although DOE and EPA technical personnel identified several elements that required revision:</p> <ul style="list-style-type: none"> <li>Providing a reference to justify the assigned waste matrix code of S5100</li> <li>Expanding the Waste Material Parameter Section 5.4.1.2 to include a description of all materials.</li> <li>Correct references pertaining to Section 8 of the report.</li> <li>The Report contains two Attachment "T"s; the duplication should be rectified.</li> <li>The Projected waste volume, Attachment 2, is dated and lacks adequate explanation</li> </ul> <p>These corrections were made during the inspection and a revised AK Summary, CCP-AK-LANL-008 Rev. 1, was issued during the inspection.</p>
<p>Site procedures require that additional information be collected before waste may be shipped if the required AK information is not available for a</p>	<p>CCP-TP-005 Rev. 14</p>	<p>Additional information is collected before waste may be shipped if the required AK information is not available for a waste stream.</p>	<p>Y</p>	<p>DR001; site will not ship sealed source unless all necessary information and demonstrations are made.</p>

**Attachment A. Acceptable Knowledge (AK) Checklist**

Establishment of Required Technical Elements in Procedures	Y/N Location	Execution of Procedures	Y/N	Objective Evidence/Comment
waste stream.				
<p>The site has a written procedure for the confirmation of AK information using analytical data, including NDA/NDE and/or VE.</p> <p>This procedure applies to both retrievably-stored and newly generated waste.</p> <p>This procedure requires a reevaluation of AK if NDE/NDA or VE identify it to be a different waste matrix code. This procedure describes how the waste must be reassigned, based on the AK reevaluation.</p>	CCP-TP-005 Rev. 14	<p>AK information is confirmed using analytical data, including NDA/NDE and/or VE.</p> <p>Has the acceptable knowledge expert calculated the percent changes in matrix parameter categories (MPCs) based on AK and NDE/VE? Were accuracy evaluations assigned? Are these acceptable?</p>	Y	CCP-TP-005, Attachment 13; Confirmation checklist. Note that since the site is not performing measurements on Sealed Sources, confirmation of AK via NDA measurement is not applicable.
<p>Procedures require the following steps to be followed if wastes are reassigned to a different waste matrix code based on NDA/NDE or VE:</p> <ul style="list-style-type: none"> <li>Review existing information based on the container identification number and document all differences</li> <li>Reassess and document all analytical data associated with the waste</li> <li>Reevaluate waste material parameter determinations and document any changes</li> <li>Reevaluate the radionuclide content and document any changes</li> <li>Verify and document that the reassigned waste matrix code was generated within the specified time period, area and buildings, waste generating process, and that the process material inputs are consistent with the waste material parameters identified during radiography or visual examination</li> <li>Record all changes to acceptable knowledge records</li> <li>If discrepancies exist in the acceptable knowledge information for the reassigned waste matrix code, complete a nonconformance report, document the</li> </ul>	CCP-TP-005 Rev. 14	<p>The following steps are followed if wastes are reassigned to a different waste matrix code:</p> <ul style="list-style-type: none"> <li>Review existing information based on the container identification number and document all differences</li> <li>Reassess and document all analytical data associated with the waste</li> <li>Reevaluate waste material parameter determinations and document any changes</li> <li>Reevaluate the radionuclide content and document any changes</li> <li>Verify and document that the reassigned waste matrix code was generated within the specified time period, area and buildings, waste generating process, and that the process material inputs are consistent with the waste material parameters identified during radiography or visual examination</li> <li>Record all changes to acceptable knowledge records</li> <li>If discrepancies exist in the acceptable knowledge information for the reassigned waste matrix code, complete a nonconformance report, document the</li> </ul>	Y	No reassignment has yet been required based on VET.

**Attachment A. Acceptable Knowledge (AK) Checklist**

Establishment of Required Technical Elements in Procedures	Y/N Location	Execution of Procedures	Y/N	Objective Evidence/Comment
segregation of this container, and define the corrective actions necessary to fully characterize the waste		segregation of this container, and define the corrective actions necessary to fully characterize the waste		
Does the site have procedures for shipment revocation and procedures for notification of CBFO when a container is revoked?	CCP-TP-005 Rev. 14	Has a waste stream been revoked based either on AK information or reassessment as part of reconfirmation?  If so, was the procedure(s) followed?	Y	No shipments have been revoked to date.
Until discrepancies are resolved, shipment of the waste stream to the WIPP is prohibited	CCP-TP-005 Rev. 14	If data consistently indicate discrepancies with acceptable knowledge information, the site increases sampling, reassesses the materials and processes that generate the waste, and resubmits waste stream profile information.	Y	DR001; discrepancies and NCRs must be resolved prior to sealed source shipment.