

Once Upon a Repackaging Effort - 9407

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ABSTRACT

This paper describes the transuranic (TRU) waste repackaging activities completed, the lessons learned, and the scheduled repackaging activities at the Sandia National Laboratories/New Mexico (Sandia), designated as a small quantity site (SQS) by the National TRU Program (NTP). The TRU waste at Sandia was generated primarily from the decontamination and cleanout of glove boxes at the Hot Cell Facility (HCF) at Technical Area (TA) V, where several related experiments were conducted. The TRU waste was initially packaged in the mid and late 1990s and does not meet the current transportation requirements of the contact-handled (CH) or remote-handled (RH) transporters (e.g., TRUPACT-II or RH 72-B) or the *Waste Isolation Pilot Plant Waste Acceptance Criteria* (WIPP WAC). Therefore, the waste must be repackaged into compliant configurations and these operations must be fully documented.

This paper also describes the process used and procedures developed to conduct the repackaging operations and the changes initiated because of a new guidance document from the Department of Energy - Headquarters (DOE/HQ). The paper will also list the inventory, identify the different campaigns, discuss the challenges, and report on the final product. In addition, this paper will also present the schedule and plans for repackaging the high dose, high activity TRU waste in the Auxiliary Hot Cell Facility (AHCF) at TA-V.

INTRODUCTION

Sandia is located in Bernalillo County in north-central New Mexico, immediately south of Albuquerque, within the boundaries of Kirtland Air Force Base. Sandia is owned by the DOE and has been operated jointly by DOE and a Management and Operating (M & O) contractor for over 50 years. The current contractor is Lockheed-Martin, LLC. The Sandia site is divided into five technical areas (TAs). The TRU waste discussed in this paper was generated in the HCF located in TA-V, Building 6580.

The HCF was located in the basement of Building 6580 and contained steel confinement boxes, a glove box laboratory, ancillary analytical equipment, support areas, and fissile- and radioactive-material storage areas. It had the capability for working with experiments and materials containing up to a nominal maximum of 6000 Curies (Ci) of fission products and 500 Ci of plutonium or other fissile material. Research projects conducted in the HCF included material, fuel, and safety studies. There were seven projects conducted in the HCF that generated the TRU waste discussed in this paper. They were all part of the Severe Accident Research Program, funded by the Nuclear Regulatory Commission (NRC) and the DOE.

The HCF provided support to the Annular Core Research Reactor (ACRR), both of which were managed by the Office of Defense Programs to provide for defense research needs. Experiments conducted in the HCF were performed over several years where Sandia investigated severe accident scenarios resulting

from fuel disruption; axial relocation of breeder reactor fuel; and vapor pressure of mixed oxide (MOX) fuels during reactor accidents. In the late 1990s the HCF was decontaminated and cleaned out; the waste was packaged to meet the Sandia waste acceptance criteria; and the Regulated Waste/Nuclear Material Disposition Department (RWNMDD) stored the waste until ready for disposal at the WIPP.

Sandia is not certified to ship TRU waste directly to the WIPP for disposal, but instead, must send their TRU waste to a centralization site for final certification and shipment to WIPP. The Idaho National Laboratory (INL), specifically the Advanced Mixed Waste Treatment Project (AMWTP), has been approved as a centralization site. In order to prepare shipment to the centralization site, the Sandia TRU waste must be repackaged to meet transportation requirements and the acceptable knowledge documented and approved. The RWNMDD is responsible for management, storage, and disposition of the TRU waste and is the managing department for the Radioactive and Mixed Waste Management Facility (RMWMF), a radiological facility that has the capability to process and repackage TRU waste that is below the Hazard Category-3 (HC-3) threshold and categorized as CH. Some of the TRU waste is high dose and/or HC-3 TRU waste and will be repackaged in the AHCF in FY09 and FY10 respectively.

The RMWMF is located in TA III several miles south of the Wyoming gate on Kirtland AFB. The CH, less than HC-3 TRU waste was repackaged in Building 6920, which houses a Permacon® structure equipped with glove boxes. Figure 1 is a map illustrating the location of Sandia TAs. Figure 2 is a picture of the glove boxes within the Permacon® where this repackaging effort was conducted.

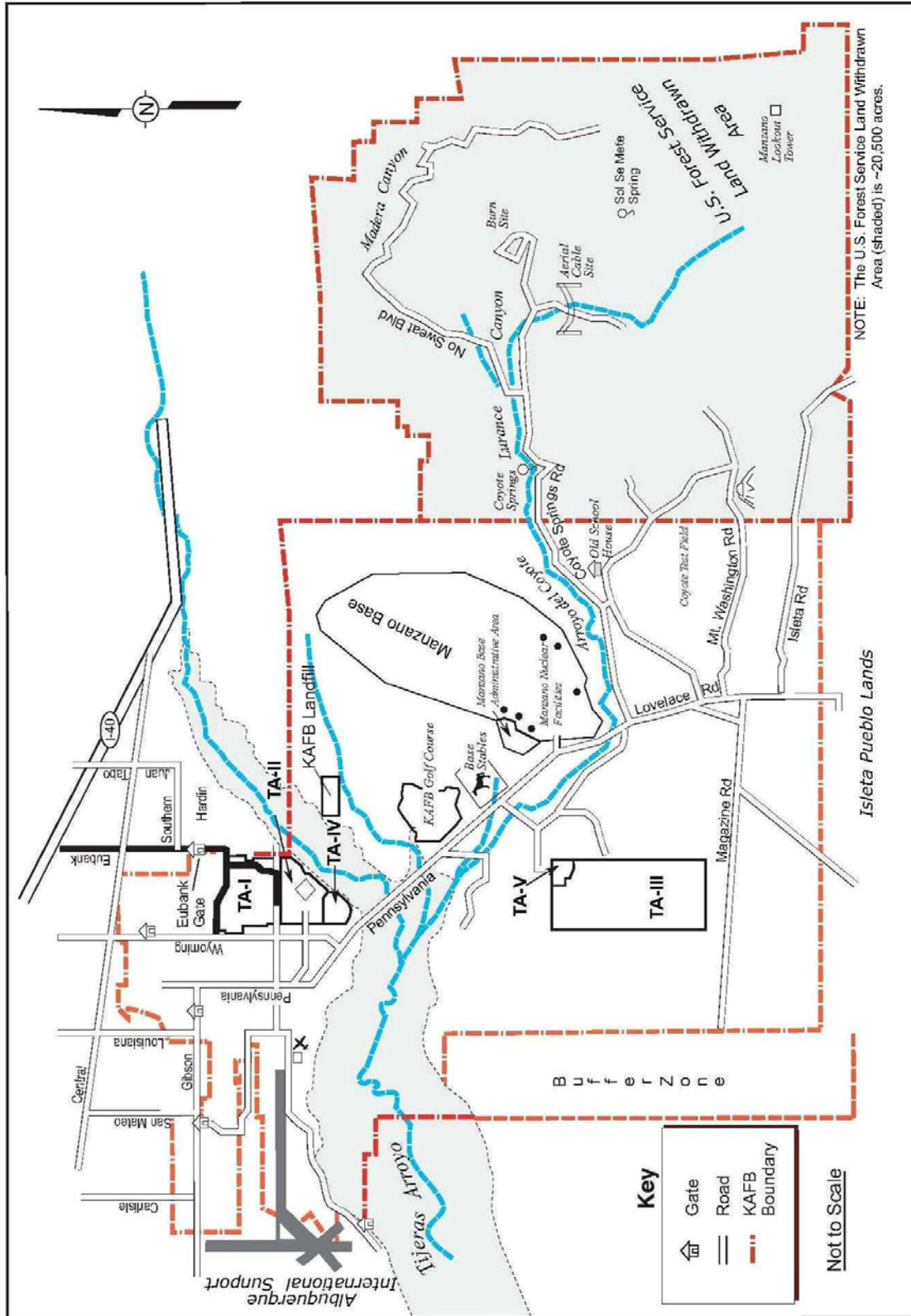


Fig. 1. Map of Sandia National Laboratories/New Mexico



Fig. 2. Glovebox

Beginning in September FY07 and continuing through October FY09, the RWNMDD actively repackaged the CH TRU waste to meet FY08 performance milestones. The CH TRU waste was divided into categories based on content, activity, dose, Resource Conservation Recovery Act (RCRA) constituents, and ease of handling (i.e., easy to difficult). The categories then became campaigns and during the 13 months, five campaigns were completed.

WASTE INVENTORY

The Sandia TRU waste inventory consisted of approximately 84 containers of mixed and non-mixed, CH and RH, sealed sources, and less than and HC-3 threshold debris waste stored in cans, small buckets, 20-, 30-, 55-gallon drums, casks, and large boxes. The waste was generated by experiments conducted at Sandia's ACRR in the 1980's and initially packaged during decommissioning and cleanout of glove boxes in the 1990s at the HCF located in TA-V. The waste includes sealed sources, personal protective equipment (PPE), small tools, pre-?, roughing, and high efficiency particulate air (HEPA) filters, plastic bags, swipes, lead bricks, decontamination debris, rubber gloves, metal pieces from equipment, laboratory glassware, plastic bottles, duct tape, wire, and tubing. The inventory includes:

- Nineteen containers of sealed sources that will be repackaged by the Los Alamos National Laboratory (LANL) Off-Site Source Recovery Program (OSRP);
- Thirty-seven containers were identified as qualifying for repackaging at a radiological facility; four containers were subsequently determined to be LLW;
- Eleven containers were RH, but less than HC-3 and will be repackaged in the Auxiliary Hot Cell Facility (AHCF); and
- Seventeen containers are HC-3 which will be repackaged in the AHCF pending authorization basis updates and approval.

CAMPAIGN PLANNING

The RWNMDD began the planning process for the TRU waste repackaging in FY07 by reviewing and documenting the WIPP requirements for transportation and disposal and reviewing the Sandia TRU waste inventory. At that time, DOE/HQ had not issued the repackaging guidance for small quantity generators, therefore, Sandia used the CCP visual examination procedure as a guide for preparing for the repackaging effort and documenting the required information.

A repackaging plan was prepared that documented the process, listed the TRU waste inventory, proposed a schedule, and included a work instruction and data form. Several objectives were established for the repackaging effort including:

- Repackage TRU waste into WIPP compliant packaging configurations to meet weight, fissile gram equivalent (FGE), plutonium equivalent Curies (PECi), and decay heat limits;
- Minimize dose to workers;
- Document and video/audio record the repackaging activities;

- Remove and/or remediate prohibited items;
- Remove all layers of confinement to maximize decay heat limits;
- Identify waste less than 100 nCi/g and segregate;
- Segregate mixed items from non-mixed if appropriate; and
- Consolidate waste into fewer containers, if possible.

Initial planning for the TRU repackaging involved:

- Identifying and documenting transportation and disposal requirements,
- Identifying packaging materials and ordering from authorized vendors,
- Preparing and delivering WIPP requirements training, and
- Reviewing and grouping the inventory
- Calculating decay heat of each container

A review of the existing data documented in the disposal requests (DRs) was initiated. The DRs include physical, chemical, and radiological data for each container and/or package. Each container was evaluated for the following: physical characteristics (packaging log), hazardous constituents, dose, isotopic activity, current packaging configuration, percent of HC-3 threshold, and storage location. Based on the information documented in the DR, the waste containers were divided into groups: non-mixed containers, mixed containers, boxes, high dose but less than HC-3, and high dose HC-3 waste. These groups were further divided into campaigns. The RWNMDD defines campaigns as a repackaging project identified for RWNMDD organizational and planning purposes and documented in a work plan.

A work plan for each campaign was prepared, reviewed, and approved that included a list of containers to be repackaged, the steps required to repackage, radiological characteristics including activity, dose rate, PPE requirements, a pre-job checklist, hold points, and training materials for the campaign. Each work plan is reviewed and approved by health physicists, ES&H personnel and sorting supervisors. The TRU waste specialists review and concur. In some cases, the packages undergo assay before repackaging to remove any LLW from the inventory.

Five campaigns were conducted in September FY07, February, August, and September FY08, and October FY09 at the RMWMF. The RMWMF is a radiological processing area with glove boxes for the safe handling of TRU waste and technical staff experienced in sorting and repackaging waste with known and unknown process knowledge. These campaigns included three for non-mixed containers, one for mixed containers, and one for boxes. All waste was placed in 55-gallon drums or, in the case of some high dose waste, in 30-gallon lever-lock containers. Table I lists the five campaigns, the waste items, and the volume reduction obtained.

Table I. Contact-Handled Campaigns

Campaign	Input Containers	Waste Description	Output Containers	Volume Reduction
07-14	5-, 30- and 55-gallon	PPE, rubber gloves and booties, herculite, paper wipes, plastic bags	4 55-gallon	0.23 m ³
	2.5-, 5-, 20-,	Metal filings, plastic	1 55-gallon	

08-08A	30- and 55-gallon	packaging, tape, paper wipes, paint cans, PPE		0.23 m ³
08-08C	55-gallon, 744 box, and tube	Wires, filters, plastic bottles and packaging, metal hardware, PPE	2 55-gallon and 1 30-gallon	2.62 m ³
08-09	3 5-, 8-, 20-, 30-, and 3 55-gallon	Filters, maranellis with filter samples, silver solder and wires, paper wipes, PPE	5 55-gallon	+0.21 m ³
08-08B	3 30- and 4 55-gallon	Tools, plastic sheeting and packaging, paper wipes, PPE	3 55-gallon and 1 30 gallon	0.45 m ³
5.78 m ³ became LLW				

CAMPAIGN EXECUTION

After the work plan was approved for a specific campaign and scheduled, a pre-job meeting was held to review the work plan and hold points, discuss the repackaging steps, review the WIPP requirements, and answer any questions and concerns. Each campaign involved two sorting supervisors, one cinematographer, and a minimum of one radiological control technician (RCT).

There were two stages to each set of containers repackaged. The first was the actual repackaging effort. One or multiple containers were repackaged into a 55 gallon drum equipped with WIPP approved filters. Initially, Sandia installed NucFil® 013 filters for the first two campaigns because we packaged with no layers of confinement and ensured each container was below the decay heat limit for the purposes of avoiding performing FlamGas sampling and analysis. But after attending the SQS consolidation meeting held June 2 and 3, 2008, WIPP indicated that all SQSs would be required to perform FlamGas sampling regardless of the decay heat, so NucFil® 019DS filters were installed in all remaining repackaged drums.

The second stage was the removal of the lids from the 55 gallon drums and the liner bags slashed to remove the last layer of confinement. Even though FlamGas sampling must be conducted, the liner bag slashing is still performed as the DAC is only 4 days.

During the June 2008 SQS meeting, new packaging/repackaging guidance was introduced. While the actual guidance was not issued until October 2008, Sandia modified their process to try to capture any additional requirements. The major portions of Sandia's repackaging process met or exceeded the CCP visual examination procedure, but there were a few requirements in the new guidance that needed to be incorporated into Sandia's process. They were:

- Tampering indicator devices (TIDs) were to be attached when the repackaged drum lid was bolted. Sandia's procedure does not require TIDs to be placed on the drum until right before shipment to allow the certification official to examine the contents. Sandia began attaching TIDs immediately after repackaging, and a TID was attached after liner bag slashing.
- As discussed above, FlamGas sampling and analysis would be a requirement, therefore, Sandia began using WIPP approved filters to allow for direct sampling.
- The videotaping requirements were very detailed and required continuous recording unless verbally documented, and also all input and output container numbers to be videotaped.

TRANSPORTATION TO CENTRALIZATION SITE

The DOE Carlsbad Field Office (CBFO) and LANL-Carlsbad Operations provide a Central Characterization Project (CCP) Mobile Loading Unit (MLU) to support loading activities for TRU waste within the DOE complex. The MLU team is certified under DOE for TRU waste loading and shipment directly to WIPP or to a centralization site. The MLU team is responsible for providing a WIPP Transportation Certification Official and two MLU operators/helium leak testers. The CCP MLU is also responsible for performing flammable gas sampling and analysis in accordance with *Waste Isolation Pilot Plant Flammable Gas Analysis*, DOE/WIPP 06-3345 (DOE/WIPP 2008c). Sandia is responsible for providing a point of contact (POC), 2 RCTs, 1 crane operator, 1 forklift operator, 1 spotter, and 1 transportation person (for generating shipping manifest). CBFO is responsible for providing the tractor/trailer, the certified driver, and the Type B shipping containers.

Initially, Sandia was scheduled to ship to the centralization site in calendar year 2010, with CH waste being shipped first in the third quarter of FY10, and the RH being shipped in the first quarter of FY11. The CCP MLU met with the RWNMDD and TA-V staff on April 9, 2008 to tour the AHCF and determined that the AHCF could accommodate loading operations. The CCP MLU forwarded photos of loading operations at other DOE sites and provided links to loading operations manuals. The RWNMDD, TA-V, and the CCP MLU will jointly conduct loading operations into a TRUPACT-II and/or HalfPACT in accordance with *CH Packaging Operations Manual*, DOE/WIPP 02-3184 (DOE/WIPP 2008d) and *RH Packaging Operations Manual*, DOE/WIPP 02-3284 (DOE/WIPP 2008e).

Recently, Sandia was notified that there was a window of opportunity to ship waste to the AMWTP during the WIPP maintenance shutdown. The WIPP trucks and TRUPACT-IIs would be available as shipments to WIPP were going to be suspended until the maintenance shutdown was complete. Sandia responded positively and are currently working with WIPP to prepare for shipments. Many groups, resources, and luck must come together in order for this opportunity to become reality. Acceptable Knowledge reports must be written, reviewed, and approved, videotapes and/or real time radiography reviewed and approved, Unresolved Safety Questions (USQs) resolved, priorities realigned, and weekly communication between WIPP and Sandia.

LESSONS LEARNED

Needless to say, there were many lessons learned.

- The waste description by generators as documented on the DR was not always complete and in some cases, inaccurate. The generator would document the major items, but not any minor items. In most cases this was not a problem, however, sometimes the predetermined number of packages to be repackaged in a single drum had to be adjusted.
- The TRU concentration assigned initially by the generator was usually conservative. Sandia re-assayed packages before repackaging, hence, some waste designated as TRU initially, was determined to be low level. This significantly contributed to the volume reduction.
- Videotaping was not as easy as first thought. The placement of the sorting supervisors outside the glove box and the orientation of the video camera had to be adjusted to obtain the detail required on the videotapes. Subsequently, the videotapes became more clear and detailed with each campaign.

- Those involved in the repackaging effort were not accustomed to the detail required for the paperwork, waste tracking, videotaping, and acceptable knowledge requirements.

SCHEDULED FUTURE CAMPAIGNS

In FY09, the RH < HC-3 threshold TRU waste (11 containers) will be repackaged at the AHCF. Approval of a Basis for Interim Operation (BIO) is not required, but approval of a transportation Documented Safety Analysis (DSA) is required and two campaigns are scheduled. The RWNMDD will provide an inventory list, obtain required supplies, support TA-V with preparation of work plans, provide specific training on the WIPP requirements for repackaging, provide video/audio documentation, and transport containers to the AHCF from storage and return to storage. TA-V will be responsible for the preparation of the work plans, and provide qualified AHC operators and RCTs.

In FY10, the HC-3 TRU waste (17 Sandia containers plus one Lovelace Respiratory Research Institute (LRRRI) container) is scheduled to be repackaged at the AHCF. Approval of the BIO is required and two campaigns are scheduled. The RWNMDD will provide an inventory list, obtain required supplies, support TA-V with preparation of work plans, provide specific training on the WIPP requirements for repackaging, provide video/audio documentation, and transport containers to the AHCF from storage and return to storage. TA-V will be responsible for the preparation of the work plans and execution of the repackaging by providing AHCF qualified operators and RCTs.

CONCLUSIONS

The Sandia repackaging effort has been a success even with some stumbling blocks. If some of the waste can be shipped to the AMWTP during FY09, Sandia will have accomplished their goals for this shipping window of opportunity. The personnel involved in this effort have made the adjustments necessary to update processes to meet the requirements of WIPP, to adjust schedules, and work with different departments to accomplish the goals of this program.

The future campaigns for the RH and HC-3 waste will have their challenges, but Sandia is certain they will meet all of the WIPP requirements and this effort will also be a success.

REFERENCES

DOE/WIPP 2005, Contact Handled Transuranic Waste Authorized Methods of Payload Control (CH-TRAMPAC)

DOE/WIPP 2006, Remote Handled Transuranic Waste Authorized Methods of Payload Control (RH-TRAMPAC)

DOE/WIPP 2008a, Transuranic Waste Acceptance Criteria for the Waste Isolation Pilot Plant (WIPP WAC), DOE/WIPP 02-3122

DOE/HQ 2008, Contact-handled Transuranic Waste Packaging Instructions and Remote-handled Transuranic Waste Packaging Instructions

DOE/WIPP 2008c, Waste Isolation Pilot Plant Flammable Gas Analysis, DOE/WIPP 06-3345

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