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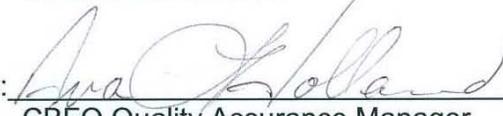
CCP Waste-Specific Data Package TRAMPAC for Brookhaven National Laboratory

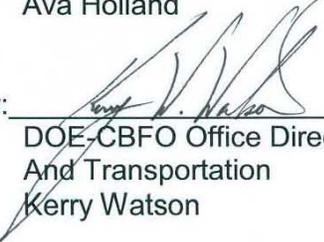
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1.0 INTRODUCTION

1.1 Purpose

The purpose of this Waste-Specific Data Package TRAMPAC for Brookhaven National Laboratory (BNL) is to describe and document how each of the requirements for HalfPACT transportation is met for one 55-gallon drum of contact-handled (CH) transuranic (TRU) waste to be transported from BNL. The transportation requirements are defined in the Contact-Handled Transuranic Waste Authorized Methods for Payload Control (CH-TRAMPAC) [1]. As specified in Section 1.4 of the CH-TRAMPAC, a waste-specific data TRAMPAC may be written by the shipper and approved by the U.S. Department of Energy Carlsbad Field Office for small quantity shipments. This Waste-Specific Data Package TRAMPAC for BNL documents the evaluation of waste data against the requirements of the CH-TRAMPAC. The data evaluation and the documentation of compliance results in this document were completed in accordance with the quality assurance (QA) program [2] under the Central Characterization Project (CCP) Waste Isolation Pilot Plant (WIPP) certification program.

This document presents the information necessary for shipment of one 55-gallon drum of CH TRU waste from BNL.

1.2 Scope

This *Waste-Specific Data Package TRAMPAC for BNL* applies to Drum BNL-45444.

1.3 Background

Virgin plutonium incinerator ash was transferred from the Rocky Flats Plant (RFP) to BNL in March 1979 [3]. This material was used by BNL in an experiment that involved the testing of different types of solidification agents, and the solidification experiment resulted in the generation of eight 1-gallon paint cans of stabilized plutonium ash on October 28, 1982. The waste within the cans includes small porcelain preparation crucibles and solidified ingots, many of which were placed in plastic vials. At the time of generation, the cans were stored in a 30-gallon galvanized iron can (GI Can).

In November 1982, the GI Can containing the eight paint cans was removed from the generator area and placed in storage at the BNL Waste Management Facility. The BNL process for removal of waste from a generator area required that a Radioactive Waste Control Form be

completed by the generator and submitted to the Waste Management Group [4].

Between 1999 and 2000 the contents of the GI Can (eight paint cans) were repackaged into one open-head 55-gallon drum. Each paint can was double-bagged in plastic. This drum was moved to the new Waste Management Facility (WMF) and placed into storage on November 21, 2002.

In November 2004, the drum was opened to verify its contents and markings. The eight paint cans were identified and photographed. The contents of two paint cans selected for opening were also photographed [5].

In June 2005, the drum was repackaged into a new 55-gallon drum (Drum BNL-45444) in accordance with WM-SOP-572, Managing Radioactive Materials at the WMF [6], and TWD-05-10, Rocky Flats Plutonium Ash Re-Packaging [7]. During the repackaging, the plastic bags surrounding each paint can were punctured [7].

In addition to BNL waste program documents and data, this document references CCP plans and procedures that have been or will be used to qualify Drum BNL-45444 for shipment. Acceptable Knowledge for Drum BNL-45444 has been assembled, evaluated, and documented by the CCP in accordance with the QA program [2] under the CCP WIPP certification program. The following CCP documents will be implemented for the certification of Drum BNL-45444 based on the compliance data documented herein:

- CCP-PO-003, *CCP Contact-Handled Transuranic Waste Authorized Methods for Payload Control (CH-TRAMPAC)* [8]
- CCP-TP-033, *CCP Shipping of CH TRU Waste* [9]
- CCP-TP-030, *CCP TRU Waste Certification and WWIS Data Entry* [10].

2.0 CONTAINER AND PHYSICAL PROPERTIES REQUIREMENTS

2.1 Authorized Payload Containers

As specified by Section 2.1.1 of the CH-TRAMPAC, a 55-gallon drum is an authorized payload container for transport in the HalfPACT, provided it meets the specifications of Section 2.9.1 of the CH-TRAMPAC [1]. Drum BNL-45444 is a 55-gallon drum that was procured to Type A specifications in accordance with CCP-QP-015, *CCP Procurement* [11], receipt inspected in accordance with CCP-QP-026, *CCP Inspection Control* [12], and provided to BNL. Upon receipt at BNL, the 55-gallon drum was inspected by BNL personnel to ensure its good condition and compliance with procurement requirements in accordance with WM-ADM-925, *Inspection and Acceptance of Purchased Items* [13].

Section 2.1.2 of the CH-TRAMPAC also requires the inspection of the integrity of the payload container prior to shipment [1]. Prior to transport, the integrity of Drum BNL-45444 will be visually inspected by CCP personnel in accordance with CCP-TP-033 [9].

2.2 Dunnage

As specified in Section 2.2 of the CH-TRAMPAC, a shipper shall use empty 55-gallon drums as dunnage to complete a payload configuration if too few loaded payload containers are available. The dunnage container(s) must meet the specifications of Section 2.9 of the CH-TRAMPAC with the exception that dunnage containers shall have at least one open vent port (i.e., not filtered or plugged). Six empty 55-gallon drums will be used as dunnage to complete the HalfPACT payload containing Drum BNL-45444. BNL dunnage containers meet the 55-gallon drum specifications of Section 2.9.1 of the CH-TRAMPAC, except as required by Section 2.2 of the CH-TRAMPAC, dunnage containers have open vent ports (i.e., not filtered or plugged). The empty 55-gallon drums meeting these specifications were obtained for use as dunnage containers in accordance with the procedural guidance provided in WM-ADM-925 and WM-ADM-935, *ESH&Q Hazard Category and Quality Level Designation with the Q-List* [13,14].

2.3 Container/Assembly Weight

2.3.1 Container/Assembly Weight

Each payload container, payload assembly, and loaded HalfPACT shall comply with the applicable weight limits specified in Section 2.3 of the CH-TRAMPAC [1]. The applicable weight limits for Drum BNL-45444 and the BNL dunnage containers (55-gallon drums) are as follows [1]:

- 1,000 pounds per 55-gallon drum
- 7,600 pounds per payload assembly of 55-gallon drums, including pallet, guide tubes, slip sheets (optional), reinforcing plates, and banding material
- 18,100 pounds per loaded HalfPACT.

As specified by Section 2.3.2.1 of the CH-TRAMPAC, the weight of each payload container (or dunnage) shall be determined using a calibrated scale [1]. Drum BNL-45444 and the BNL dunnage containers were weighed in accordance with WM-SOP-572 [6]. As specified in Section 2.3.2.1 of the CH-TRAMPAC, the scale calibrations shall be in accordance with the National Institute for Standards and Technology (NIST) Handbook 44 or an equivalent standard [1]. The BNL Standards Base Management System [15] requires scales to be calibrated with certification traceable to the NIST standard. Scale calibration information for Drum BNL-45444 and BNL-DUN-01 through BNL-DUN-06 was documented by Bernat Balance Service [16]. Based on the calibration of the scale used to measure the weight of Drum BNL-45444 and the dunnage containers, the error associated with the weight values is 2 percent [17]. The following table summarizes the weights for each payload container and dunnage container:

Payload Container No.	Weight (Pounds)	Error (2%) (Pounds)	Value Plus Error (Pounds)	Maximum Allowable Gross Weight Limit (Pounds)
Drum BNL-45444	84	1.68	85.68	1,000
BNL-DUN-01	60	1.20	61.20	1,000
BNL-DUN-02	60	1.20	61.20	1,000
BNL-DUN-03	60	1.20	61.20	1,000
BNL-DUN-04	60	1.20	61.20	1,000
BNL-DUN-05	59	1.18	60.18	1,000
BNL-DUN-06	59	1.18	60.18	1,000

Drum BNL-45444 and each dunnage container comply with the applicable maximum allowable gross weight limit per 55-gallon drum of 1,000 pounds following the addition of the measurement error, as specified in Section 2.3.1.1 of the CH-TRAMPAC [1].

In accordance with CCP-PO-003 [8], CCP personnel will calculate the total weight of the 7-drum payload assembly and evaluate compliance with the maximum payload assembly and loaded HalfPACT limits as specified above and in Section 2.3 of the CH-TRAMPAC. The total weight for all containers is 442 pounds. As required by Section 2.3.2.1 of the CH-TRAMPAC, if the total payload gross weight is obtained by summing the weights of the individual payload containers or dunnage, it shall include the square root of the sum of the squares of the individual measurement errors. The square root of the sum of the squares of the individual measurement errors is 3.37 pounds. The total weight plus error for the payload is 445.37 pounds, well below the maximum payload assembly weight limit of 7,600 pounds per HalfPACT. As such, the payload assembly weight limit will be met for the payload comprised of these containers.

2.3.2 Center of Gravity

As specified by Section 2.3.1.2 of the CH-TRAMPAC, no center of gravity requirements exist for HalfPACT payloads [1].

2.4 Container Marking

As specified by Section 2.4.1 of the CH-TRAMPAC, each payload container shall be labeled with a unique container identification number [1]. In accordance with WM-SOP-510, *Review of Radioactive and Accountable Nuclear Material Waste Control Forms* [17]; WM-SOP-572 [6]; and WM-SOP-725, *WM Waste Tracking and Inventory Management* [19], the payload container has been labeled with the unique container identification number "BNL-45444." As specified in Section 2.4 of the CH-TRAMPAC, if a dunnage container is used to complete a payload assembly, the dunnage container shall be labeled with a unique identification number and "EMPTY" or "DUNNAGE" [1]. In accordance with WM-SOP-510, WM-SOP-572, and WM-SOP-725, each dunnage container is labeled with "DUNNAGE" and a unique identification number as follows [6, 18, 19]:

- BNL-DUN-01
- BNL-DUN-02
- BNL-DUN-03
- BNL-DUN-04
- BNL-DUN-05
- BNL-DUN-06.

2.5 Filter Vents

As specified by Section 2.5 of the CH-TRAMPAC, each payload container to be transported in the HalfPACT shall have one or more filter vents that meet the specifications of Section 2.5 of the CH-TRAMPAC [1]. Drum BNL-45444 was procured with one filter in accordance with CCP-QP-015 [11] and receipt inspected in accordance with CCP-QP-026 [12]. The empty drum was provided to BNL by CCP along with instructions for the installation and maintenance of the filter from CCP-TP-082, *CCP Preparing and Handling Waste Drums for Headspace Gas Sampling* [20]. In conjunction with these instructions, BNL personnel installed and maintained the filter in accordance with WM-SOP-572 [6] and WM-SOP-578, *Shipping Low Level Radioactive Waste* [21], and completed receipt inspections in accordance with WM-ADM-925 [13].

The following table summarizes the filter information for Drum BNL-45444 documenting compliance with the filter specifications of Section 2.5 of the CH-TRAMPAC:

Payload Container No.	Container Type	Filter Model^a	Supplier^a	Filter Vent ID^a	Minimum Hydrogen Diffusivity (mol/s/mol fraction)
BNL-45444	55-gallon drum	NUCFIL-019DS	Nuclear Filter Technologies	GE1927	1.85E-05

^aSource: Nuclear Filter Technology, Certificate of Conformance for NucFil Direct Sample Carbon HEPA Filter for Purchase Order #00034926, dated July 27, 2004.

mol/s/mol fraction = Moles per second per mole fraction.

As stated in Section 2.2, dunnage containers BNL-DUN-01 through BNL-DUN-06 have open vent ports (i.e., not filtered or plugged) as required by Section 2.2 of the CH-TRAMPAC.

2.6 Liquids

As required by Section 2.6 of the CH-TRAMPAC, liquid waste is prohibited in payload containers, except for residual amounts in well-drained containers [1]. The experiment that generated the waste resulted in stabilized plutonium ash. The *Request for Disposal, Decontamination & Storage of Radioactive Materials at the Hazardous Waste Management Facilities* [4] documented the material description for Drum BNL-45444 as "solid." In addition, in November 2004, Drum BNL-45444 was opened to verify selected contents including the absence of liquids. The absence of liquids was documented on the radiological survey form by the BNL Health Physicist [22]. As such, the total volume of residual liquid in Drum BNL-45444 is documented to be less than 1 percent (volume).

2.7 Sharp or Heavy Objects

As required by Section 2.7 of the CH-TRAMPAC, sharp or heavy objects in the waste shall be blocked, braced, or suitably packaged as necessary to provide puncture protection for the payload containers packaging these objects [1]. Paint Cans 1 through 8 packaged in Drum BNL-45444 contains the following waste items [22]:

Paint Can Identification	Contents ^a
Paint Can Nos. 1 – 6	Each contains 19 plutonium waste forms of polyester-styrene, Portland I cement, urea-formaldehyde, and bitumen
Paint Can No. 7	Fourteen polyester-styrene and bitumen waste forms and two porcelain preparation crucibles
Paint Can No. 8	Eight cement and polyester-styrene waste forms

^a Many of the solidified waste forms (ingots) are in plastic vials.

The waste forms contained by the paint cans do not qualify as sharp or heavy objects. Each paint can weighs approximately 2 pounds [4, 22] and, as such, does not qualify as a sharp or heavy object. Based on this evaluation, sharp or heavy objects are not present in Drum BNL-45444.

2.8 Sealed Containers

Sealed containers greater than 4 liters (nominal) are prohibited by Section 2.8 of the CH-TRAMPAC [1]. Each paint can contained by Drum BNL-45444 is less than 4 liters (nominal) in size [5]. No other containers are present in Drum BNL-45444 [6, 18, 19]. As such, the absence of sealed containers greater than 4 liters in Drum BNL-45444 is documented.

3.0 NUCLEAR PROPERTIES REQUIREMENTS

3.1 Nuclear Criticality

As specified by Section 3.1 of the CH-TRAMPAC, a 55-gallon drum payload container shall be acceptable for transport only if the Plutonium (Pu) 239 fissile gram equivalent (FGE) plus two times the measurement error (i.e., two standard deviations) is less than or equal to the following limits [1]:

- 200 grams for a 55-gallon drum, except for drums containing greater than 1% by weight beryllium (Be) or beryllium oxide (BeO).
- 100 grams for a 55-gallon drum containing greater than 1% by weight Be or BeO.
- 55-gallon drums containing greater than 1% by weight Be or BeO and machine-compacted waste are not shippable.

Per the description of the solidification experiment that generated the waste and WM-SOP-725 [19], Drum BNL-45444 does not contain Be or BeO in concentrations greater than 1% by weight of the contents or machine-compacted waste. As such, the 200-gram FGE limit is applicable to Drum BNL-45444.

The radionuclide composition and quantities of the waste contained by Drum BNL-45444 have been determined using the information provided on the receipt document for the 1979 transfer of the virgin plutonium incinerator ash from RFP to BNL and the information recorded by the BNL generator [3, 23]. A summary of the isotopic breakdown is provided for the contents of Drum BNL-45444 in Attachment 1. Calorimeter measurement was the method of plutonium assay employed by RFP for the measurement of the incinerator ash. The typical accuracy of calorimeter measurement was 0.5%, and the adjusted distribution could have up to a 0.12% error. In order to conservatively bound the uncertainty associated with the radionuclide data summarized for Drum BNL-45444 in Attachment 1, a 10% error has been determined by BNL personnel as the upper bound of data uncertainty [17]. As such, an error margin of 10 percent bounds the error for the radiological information for Drum BNL-45444.

The following table summarizes the FGE value calculated for Drum BNL-45444 and demonstrates compliance with the 200-gram FGE payload container limit (specified in Section 3.1 of the CH-TRAMPAC [1]).

Payload Container No.	FGE (grams)	Error (10%) (grams)	Value + 2X Error (grams)	Limit (grams)
Drum BNL-45444	13.00	1.300	15.60	200

The FGE value (plus two times the 10 percent error) of Drum BNL-45444 is well below the 200-gram FGE limit per 55-gallon drum.

As specified by Section 3.1 of the CH-TRAMPAC, a HalfPACT shall be acceptable for transport only if the Pu-239 FGE plus two times the measurement error (i.e., two standard deviations) is less than or equal to the following limits [1]:

- 325 grams for a payload of 55-gallon drums, except for payloads containing greater than 1% by weight Be or BeO. If a 55-gallon drum contains machine-compacted waste in the form of "puck" drums, conditions specified in Section 3.1 of the CH TRAMPAC must be met.
- 250 grams for a payload of 55-gallon drums containing less than or equal to 1% by weight Be or BeO and machine-compacted waste.

- 100 grams for a payload of 55-gallon drums containing greater than 1% by weight Be or BeO.

For payloads of 55-gallon drums without machine-compacted waste containing less than or equal to 1% by weight Be or BeO and greater than 5 grams of Pu-240 content per payload (as determined after the subtraction of two times the error), the package limits specified in Table 3.1 1 of the CH-TRAMPAC apply.

As Drum BNL-45444 does not contain Be or BeO greater than 1% by weight, machine-compacted waste, or a significant quantity of Pu-240, the 325-gram FGE limit is applicable to the payload containing Drum BNL-45444. As shown in the above table, the FGE value (plus two times the measurement error) for Drum BNL-45444 is well below the 325-gram FGE limit per payload (dunnage containers will not contribute to the total FGE).

3.2 Radiation Dose Rates

As specified by Section 3.2 of the CH-TRAMPAC, the external radiation surface dose rate of a 55-gallon drum shall be less than or equal to 200 millirem per hour (mrem/hour) [1]. BNL has measured the surface dose rate of BNL-45444 as 11 mR/hr. Prior to shipment, the surface radiation dose rate of Drum BNL-45444 will be surveyed in accordance with FS-SOP-1050, *Radiological Surveys for Radioactive Material Shipments* [24]. As specified by Section 3.2.2 of the CH-TRAMPAC, the measurements shall be made with instruments traceable to a national standard [1]. FS-SOP-1050 requires the dose rate measurements to be made with instruments whose calibration is traceable to the BNL IC Group Technical Guide: Calibration Accuracy Reference Table for Radiation Rate Instruments, which is based on ANSI N323, *American National Standard Radiation Protection Instrumentation Test and Calibration* [24, 25]. In accordance with CCP-PO-003 [8], CCP personnel will use the data collected in accordance with FS-SOP-1050 to evaluate compliance with the 200 mrem/hour limit for Drum BNL-45444.

As specified by Section 3.2 of the CH-TRAMPAC, the external radiation dose rates of the loaded HalfPACT shall be less than or equal to 200-mrem/hour at the surface and less than or equal to 10 mrem/hour at 2 meters [1]. In accordance with CCP-PO-003 [8], CCP personnel will survey the loaded HalfPACT and evaluate compliance with these radiation dose rate limits.

4.0 CHEMICAL PROPERTIES REQUIREMENTS

4.1 Pyrophoric Materials

As specified by Section 4.1 of the CH-TRAMPAC, nonradioactive pyrophoric materials shall not be packaged into payload containers [1]. Radioactive pyrophoric materials, if present in the waste, shall be limited to less than 1 percent (weight) of the payload container [1]. The experiment that generated the waste did not involve the use of any pyrophoric materials. In addition, in November 2004, Drum BNL-45444 was opened to verify selected contents. As such, the absence of pyrophoric materials in Drum BNL-45444 is documented.

4.2 Explosives, Corrosives, and Compressed Gases

As specified by Section 4.2 of the CH-TRAMPAC, explosives, corrosives, and compressed gases are prohibited from payload containers [1]. The experiment that generated the waste did not involve the use of explosives, corrosives, or compressed gases. The Request for Disposal, Decontamination & Storage of Radioactive Materials at the Hazardous Waste Management Facilities [4] documented the material description for Drum BNL-45444 as "solid." In addition, in November 2004, Drum BNL-45444 was opened to verify selected contents including the absence of liquids, compressed gas cylinders, and explosive materials. As such, the absence of explosives, corrosives, and compressed gases in Drum BNL-45444 is documented.

4.3 Chemical Composition

As specified by Section 4.3 of the CH-TRAMPAC, chemical constituents in a payload shall conform to the lists of allowable materials in Tables 4.3-1 through 4.3-8 of the CH-TRAMPAC [1]. The total quantity of chemicals/materials not listed as allowed materials for a given waste material type in any payload container is restricted to less than 5 weight percent total [1].

The waste contained in Drum BNL-45444 is solid organic and inorganic materials, consisting of polyester-styrene, Portland I cement, urea-formaldehyde, bitumen, porcelain preparation crucibles, and plastic vials [5, 23]. The 55-gallon drum payload container has been assigned to Content Code SQ 121, TRU Solid Organic Waste, in the *CH-TRU Waste Content Codes (CH-TRUCON)* [26]. The chemicals and materials packaged in Drum BNL-45444 conform to the SQ 121 chemical list, which complies with the list of allowable materials for Waste Material Type III.1 (Table 4.3-6 of the CH-TRAMPAC) [1]. Content Code SQ 121 and its chemical list are provided in Attachment 2.

4.4 Chemical Compatibility

As specified by Section 4.4 of the CH-TRAMPAC, chemical compatibility of the payload materials shall be ensured. As specified in Section 4.4.2 of the CH-TRAMPAC, chemical compatibility of all waste material types has been demonstrated for transport in the HalfPACT using the chemicals in the allowable materials lists (Tables 4.3-1 through 4.3-8 of the CH-TRAMPAC) [1]. The restrictions imposed on the chemical constituents of the content codes ensure compliance with the compatibility requirements. Because Drum BNL-45444 contains only chemicals that conform to the SQ 121 chemical list, the chemical compatibility requirement is met.

5.0 GAS GENERATION REQUIREMENTS

As specified by Section 5.0 of the CH-TRAMPAC, the gases generated in the payload containers and released into the packaging inner containment vessel (ICV) cavity shall be controlled to maintain the pressure within the ICV cavity below the acceptable design pressure of 50 pounds per square inch gauge (psig) [1]. As described in Section 5.2.5.3.3 of the CH-TRAMPAC, compliance with the design pressure limit is ensured by the analysis presented in Chapter 3.0 of the HalfPACT SAR for Waste Type III payload containers and payloads up to a decay heat of 27 watts [1].

5.1 Payload Shipping Category

As specified by Section 5.1.1 of the CH-TRAMPAC, each payload container shall be assigned to a payload shipping category that provides information on the waste type, waste material type, and resistance to gas release from the inner layers of confinement [1]. Drum BNL-45444 is a 55-gallon drum that contains eight 1-gallon paint cans. Each paint can was originally double bagged in plastic "turkey bag" sized bags closed with duct tape using a J-seal method. During repackaging of the waste in accordance with WM-SOP-572 and TWD-05-10 all bags were punctured (i.e., eliminated as confinement layers) [6, 7]. As such, Drum BNL-45444 contains no layers of confinement as defined by the CH-TRAMPAC [6, 7, 18, 19]. A complete description of the internal packaging configuration for Drum BNL-45444 is provided in Content Code SQ 121 under packaging configuration SQ 121AB in the CH-TRUCON [26] (see Attachment 2).

The following table summarizes the payload shipping category determined from the packaging description documented in accordance with WM-SOP-510, WM-SOP-572, and WM-SOP-725 for Drum BNL-45444 [6, 18, 19]:

Payload Container No.	Content Code	Packaging Configuration	Payload Shipping Category
Drum BNL-45444	SQ 121AB	55-gallon drums (drum filter with 1.85E-05 mol/s/mf hydrogen diffusivity) with no confinement layers and no rigid liner in the drum.	30 0340 0077

Mol/s/mf = Moles per second per mole fraction.

5.2 Flammable (Gas/VOC) Concentration Limits

As specified by Section 5.2 of the CH-TRAMPAC, wastes to be transported in the HalfPACT are restricted so that no flammable mixtures can occur in any layer of confinement during shipment [1]. Based on

process knowledge and the documentation of individual waste items packaged in Drum BNL-45444, no flammable volatile organic compounds (VOCs) were used in the solidification experiment that generated the waste. As such, no flammable VOCs are present in Drum BNL-45444.

5.3 Decay Heat

As specified by Section 5.2 of the CH-TRAMPAC, compliance with flammable (gas/VOC) limits per payload container may be demonstrated by meeting a decay heat limit per payload container based on the assigned payload shipping category [1]. Radiological information summarized in Section 3.1 has been used to determine the decay heat value for Drum BNL-45444. As described in Section 3.1, the error associated with this data is bounded by a conservative value of 10 percent.

The following table summarizes the decay heat value reported to four decimal places for Drum BNL-45444 and evaluates compliance with the applicable decay heat limit following the addition of the error:

Payload Container No.	Decay Heat Value (watts)	Error (10%) (watts)	Value Plus Error (watts)	Limit^a (watts)
Drum BNL-45444	0.0565	0.0057	0.0622	0.1842

^aLimit calculated as specified in the CH-TRAMPAC from the payload shipping category listed in Section 5.1.

As shown in the above table, Drum BNL-45444 complies with the applicable decay heat limit and is well below the HalfPACT design limit of 30 watts. During payload assembly activities to be completed in accordance with CCP-PO-003 [8], CCP personnel will document compliance of the assembled payload with the applicable design limit.

5.4 Venting and Aspiration

As specified by Section 5.3 of the CH-TRAMPAC, payload containers that have been stored in an unvented condition (i.e., no filter and/or unpunctured liner) shall be aspirated for the specific length of time to ensure equilibration of any gases that may have accumulated in the closed container [1]. Drum BNL-45444 was vented at the time of packaging in accordance with WM-SOP-572 and TWD-05-10 [6, 7]. Therefore, the aspiration requirement of Section 5.3 of the CH-TRAMPAC is not applicable.

6.0 PAYLOAD ASSEMBLY REQUIREMENTS

As specified by Sections 6.1 and 6.2 of the CH-TRAMPAC, a HalfPACT payload shall be authorized for shipment by the completion and signing of the Payload Container Transportation Certification Document(s) (PCTCD) and the Payload Assembly Transportation Certification Document (PATCD) after verification of compliance with all transportation requirements of the CH-TRAMPAC [1]. The certification of Drum BNL-45444 and the payload in which it is assembled will be completed by the CCP Transportation Certification Official (TCO) in accordance with CCP-PO-003 [8] and CCP-TP-030 [10]. CCP-TP-030 details the completion of required transportation certification documents (PCTCDs and PATCD). During the completion of these documents, compliance with the transportation parameter requirements as documented in the previous sections will be verified by the CCP TCO. The shipping records, whose generation is described in CCP-PO-003, shall be maintained by the CCP for a minimum period of 3 years.

7.0 REFERENCES

1. U.S. Department of Energy, "Contact-Handled Transuranic Waste Authorized Methods for Payload Control (CH-TRAMPAC)," Revision 20, U.S. Department of Energy, Carlsbad Field Office, Carlsbad, New Mexico.
2. CCP-PO-002, "Transuranic Waste Certification Plan," current revision, Washington TRU Solutions LLC, Carlsbad, New Mexico.
3. U.S. Department of Energy and U.S. Nuclear Regulatory Commission, Nuclear Material Transaction Report documenting transfer of plutonium incinerator ash from Rockwell International to Isotopes & Special Material Group, Brookhaven National Laboratory, shipment dated February 15, 1979, receipt dated March 1, 1979.
4. Brookhaven National Laboratory, "Request for Disposal, Decontamination & Storage of Radioactive Materials at the Hazardous Waste Management Facilities," Brookhaven National Laboratory, Upton, New York, dated November 1, 1982.
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CCP-PO-019, Rev. 0
CCP Waste-Specific Data Package TRAMPAC
for Brookhaven National Laboratory

Effective Date: 07/06/2005

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Attachment 1 – Summary of Drum BNL-45444 Radionuclide Composition and Quantities

Nuclide	Can 1 Ci	Can 1 g	Wattage	FGE
238Pu	3.13E-03	1.81E-04	1.04E-04	2.04E-05
239Pu	1.10E-01	1.75E+00	3.41E-03	1.75E+00
240Pu	2.51E-02	1.09E-01	7.81E-04	2.46E-03
241 Pu	6.86E-01	6.60E-03	2.18E-05	1.48E-02
242 Pu	1.40E-06	3.53E-04	4.13E-08	2.64E-06
total	8.24E-01	1.87E+00		
241 Am	2.36E-01	6.80E-02	7.89E-03	1.27E-03
TOTAL			1.22E-02	1.77E+00

Nuclide	Can 2 Ci	Can 2 g	Wattage	FGE
238Pu	3.13E-03	1.81E-04	1.04E-04	2.04E-05
239Pu	1.10E-01	1.75E+00	3.41E-03	1.75E+00
240Pu	2.51E-02	1.09E-01	7.81E-04	2.46E-03
241 Pu	6.86E-01	6.60E-03	2.18E-05	1.48E-02
242 Pu	1.40E-06	3.53E-04	4.13E-08	2.64E-06
total	8.24E-01	1.87E+00		
241 Am	2.36E-01	6.80E-02	7.89E-03	1.27E-03
TOTAL			1.22E-02	1.77E+00

Nuclide	Can 3 Ci	Can 3 g	Wattage	FGE
238Pu	3.13E-03	1.81E-04	1.04E-04	2.04E-05
239Pu	1.10E-01	1.75E+00	3.41E-03	1.75E+00
240Pu	2.51E-02	1.09E-01	7.81E-04	2.46E-03
241 Pu	6.86E-01	6.60E-03	2.18E-05	1.48E-02
242 Pu	1.40E-06	3.53E-04	4.13E-08	2.64E-06
total	8.24E-01	1.87E+00		
241 Am	2.36E-01	6.80E-02	7.89E-03	1.27E-03
TOTAL			1.22E-02	1.77E+00

Nuclide	Can 4 Ci	Can 4 g	Wattage	FGE
238Pu	3.66E-03	2.12E-04	1.21E-04	2.39E-05
239Pu	1.12E-01	1.78E+00	3.47E-03	1.78E+00
240Pu	2.59E-02	1.13E-01	8.06E-04	2.53E-03
241 Pu	6.90E-01	6.63E-03	2.20E-05	1.49E-02
242 Pu	1.66E-04	4.18E-02	4.89E-06	3.14E-04
total	8.32E-01	1.94E+00		
241 Am	8.36E-03	2.41E-03	2.79E-04	4.51E-05
TOTAL			4.71E-03	1.80E+00

Nuclide	Can 5 Ci	Can 5 g	Wattage	FGE
238Pu	3.66E-03	2.12E-04	1.21E-04	2.39E-05
239Pu	1.12E-01	1.78E+00	3.47E-03	1.78E+00
240Pu	2.59E-02	1.13E-01	8.06E-04	2.53E-03
241 Pu	6.90E-01	6.63E-03	2.20E-05	1.49E-02
242 Pu	1.66E-04	4.18E-02	4.89E-06	3.14E-04
total	8.32E-01	1.94E+00		
241 Am	8.36E-03	2.41E-03	2.79E-04	4.51E-05
TOTAL			4.71E-03	1.80E+00

Nuclide	Can 6 Ci	Can 6 g	Wattage	FGE
238Pu	3.66E-03	2.12E-04	1.21E-04	2.39E-05
239Pu	1.12E-01	1.78E+00	3.47E-03	1.78E+00
240Pu	2.59E-02	1.13E-01	8.06E-04	2.53E-03
241 Pu	6.90E-01	6.63E-03	2.20E-05	1.49E-02
242 Pu	1.66E-04	4.18E-02	4.89E-06	3.14E-04
total	8.32E-01	1.94E+00		
241 Am	8.36E-03	2.41E-03	2.79E-04	4.51E-05
TOTAL			4.71E-03	1.80E+00

Nuclide	Can 7 Ci	Can 7 g	Wattage	FGE
238Pu	3.08E-03	1.78E-04	1.02E-04	2.01E-05
239Pu	9.46E-02	1.50E+00	2.93E-03	1.50E+00
240Pu	2.18E-02	9.48E-02	6.79E-04	2.13E-03
241 Pu	5.81E-01	5.59E-03	1.85E-05	1.26E-02
242 Pu	1.39E-04	3.50E-02	4.10E-06	2.63E-04
total	7.01E-01	1.64E+00		
241 Am	2.75E-04	7.93E-05	9.19E-06	1.48E-06
TOTAL			3.75E-03	1.52E+00

Nuclide	Can 8 Ci	Can 8 g	Wattage	FGE
238Pu	1.54E-03	8.90E-05	5.10E-05	1.01E-05
239Pu	4.73E-02	7.52E-01	1.47E-03	7.52E-01
240Pu	1.09E-02	4.74E-02	3.39E-04	1.07E-03
241 Pu	2.90E-01	2.79E-03	9.23E-06	6.27E-03
242 Pu	6.79E-05	1.71E-02	2.00E-06	1.28E-04
total	3.50E-01	8.19E-01		
241 Am	3.52E-03	1.01E-03	1.18E-04	1.90E-05
TOTAL			1.99E-03	7.59E-01

Total Wattage 5.65E-02
Total FGE 1.30E+01

Attachment 2 – CH-TRU Waste Content Codes

CH-TRU Waste Content Codes

Rev. 7, June 2005

CONTENT CODE: SQ 121, SQ 221 (See Waste Packaging Description Table)

CONTENT DESCRIPTION: Solid Organic Waste

GENERATING SITE: Various

WASTE DESCRIPTION: This waste consists of a variety of combustible and noncombustible organic items.

GENERATING SOURCES: These wastes were generated from various operations at the sites.

WASTE FORM: The waste may include combustible items such as cloth and paper products (e.g., from the cleanup of spills), rags, coveralls and booties, plastic, cardboard, rubber, wood, surgeons gloves, and Kimwipes. The waste may also include filter waste, (e.g., dry box filters, HEPA filters, and filter cartridges); noncombustible Benelex and plexiglas neutron shielding, blacktop, concrete, dirt, and sand; leaded gloves and aprons comprised of Hypalon rubber and lead oxide impregnated neoprene; and small amounts of metal waste. This waste may also include particulate and sludge-type organic process solids immobilized/solidified with Portland cement, vermiculite, Aquaset, or Petrosset. The waste may also include items from decontamination and decommissioning activities (tools, supplies, equipment, etc.) and stabilized plutonium ash.

WASTE PACKAGING: Details of the waste packaging for each code are presented in the following table:

WASTE PACKAGING DESCRIPTION TABLE

Code	Description*
SQ 121A SQ 221A	The waste is placed directly into a 55-gallon drum, an SWB, or a TDOP with no layers of confinement.
SQ 121AA SQ 221AA	The waste is placed directly into a metal can with the filter removed from the bung hole. The metal can is contained in a 55-gallon drum that is lined with a rigid liner. The rigid liner lid is removed.
SQ 121AB SQ 221AB	The waste is contained in one-gallon paint cans. The one-gallon paint cans are placed directly into a 55-gallon drum with no confinement layers and no rigid liner.
SQ 121B SQ 221B	The waste is packaged directly into one plastic bag and is then placed into a 55-gallon drum, an SWB, or a TDOP.
SQ 121C SQ 221C	The waste is packaged directly into two plastic bags and is then placed into a 55-gallon drum, an SWB, or a TDOP.
SQ 121D SQ 221D	The waste is packaged directly into three plastic bags and is then placed into a 55-gallon drum, an SWB, or a TDOP.
SQ 121DA SQ 221DA	The waste is packaged directly into two plastic inner bags and one plastic liner bag. The waste is then placed into a 55-gallon drum with no rigid liner.
SQ 121E SQ 221E	The waste is packaged directly into three plastic inner bags and is then placed into a 55-gallon drum with no rigid liner. No closed plastic liner bags are used inside the 55-gallon drum.
SQ 121F SQ 221F	The waste is packaged in three drum liner bags with twist-and-tape closures. Bagged waste is directly loaded into an SWB with two filters each having a minimum hydrogen diffusivity value of 3.7×10^{-6} mol/sec/mole fraction.

Attachment 2 – CH-TRU Waste Content Codes (continued)

CH-TRU Waste Content Codes

Rev. 7, June 2005

Code	Description*
SQ 121FA SQ 221FA	The waste is packaged in three drum liner bags with twist-and-tape closures. Bagged waste is directly loaded into an SWB with four filters each having a minimum hydrogen diffusivity value of 3.7×10^{-6} mol/sec/mole fraction.
SQ 121G SQ 221G	The waste is packaged in one heat-sealed bag meeting the specifications of Appendix 6.13 of the CH-TRU Payload Appendices. The heat-sealed bag is packaged within two inner bags with twist-and-tape closures. Bagged waste is directly loaded into an SWB with two filters each having a minimum hydrogen diffusivity value of 3.7×10^{-6} mol/sec/mole fraction.
SQ 121GA SQ 221GA	The waste is packaged in one heat-sealed bag meeting the specifications of Appendix 6.13 of the CH-TRU Payload Appendices. The heat-sealed bag is packaged within two inner bags with twist-and-tape closures. Bagged waste is directly loaded into an SWB with four filters each having a minimum hydrogen diffusivity value of 3.7×10^{-6} mol/sec/mole fraction.
SQ 121H SQ 221H	The waste is packaged in one heat-sealed bag meeting the specifications of Appendix 6.13 of the CH-TRU Payload Appendices. The heat-sealed bag is packaged within two inner bags with twist-and-tape closures. Bagged waste is directly loaded into a 55-gallon drum that is either punctured or fitted with a filter with a minimum hydrogen diffusivity value of 3.7×10^{-6} mol/sec/mole fraction. The drum has no rigid liner. Four 55-gallon drums are directly loaded into an SWB with two filters each having a minimum hydrogen diffusivity value of 3.7×10^{-6} mol/sec/mole fraction.
SQ 121HA SQ 221HA	The waste is packaged in one heat-sealed bag meeting the specifications of Appendix 6.13 of the CH-TRU Payload Appendices. The heat-sealed bag is packaged within two inner bags with twist-and-tape closures. Bagged waste is directly loaded into a 55-gallon drum that is either punctured or fitted with a filter with a minimum hydrogen diffusivity value of 3.7×10^{-6} mol/sec/mole fraction. The drum has no rigid liner. Four 55-gallon drums are directly loaded into an SWB with four filters each having a minimum hydrogen diffusivity value of 3.7×10^{-6} mol/sec/mole fraction.

* If drums are overpacked in an SWB, a TDOP, or an 85-gallon drum, no closed liner bags are used inside the SWB, the TDOP, or the 85-gallon drum. If waste is placed directly in a TDOP, any liner bag is an SWB liner. All bag closures are in accordance with the CH-TRAMPAC.

ASSAY: Assay for all payload containers shall be performed in accordance with the CH-TRAMPAC. The isotopic composition of the waste is determined from measurements taken on the product material during the processing at the site. The processing organizations transmit the isotopic composition information to the site waste certification organization. Therefore, the isotopic composition of the waste need not be determined by direct analysis or measurement of the waste unless process information is not available.

FREE LIQUIDS: Liquid waste is prohibited in the payload containers (drums, SWBs, or TDOPs) except for residual amounts in well-drained containers. The total volume of residual liquid in a payload container shall be less than 1 volume percent of the payload container. Waste packaging procedures ensure that free liquids are less than 1 volume percent of the payload container.

EXPLOSIVES/COMPRESSED GASES: Explosives and compressed gases in the payload containers are prohibited by waste packaging procedures.

PYROPHORICS: Nonradioactive pyrophorics in the payload containers are prohibited by waste packaging procedures. Waste packaging procedures shall ensure that all pyrophoric radioactive materials are present only in small residual amounts (less than 1 weight percent) in payload containers.

Attachment 2 – CH-TRU Waste Content Codes (continued)

CH-TRU Waste Content Codes

Rev. 7, June 2005

CORROSIVES: Corrosives are prohibited in the payload containers. Acids and bases that are potentially corrosive shall be neutralized and rendered noncorrosive prior to being a part of the waste. The physical form of the waste and the waste generating procedures ensure that the waste is in a nonreactive form.

CHEMICAL COMPATIBILITY: A chemical compatibility study has been performed on this content code, and all waste is chemically compatible for materials in greater than trace (>1% weight) quantities. The chemicals found in this content code are restricted to the table of allowable materials for Waste Material Type III.1 in the CH-TRAMPAC.

PAYLOAD CONTAINER VENTING AND ASPIRATION: Payload containers in this content code that have been stored in an unvented condition (i.e., no filter and unpunctured liner) will be aspirated using one of the three options described in the CH-TRAMPAC.

ADDITIONAL CRITERIA: In accordance with the CH-TRAMPAC, each drum is fitted with a minimum of one filter vent, and the rigid liner (if present) is punctured. Each SWB is fitted with at least two and up to four filters. Each TDOP is fitted with at least nine filters.

SHIPPING CATEGORY: See Table 2, Summary of Approved Content Codes and Corresponding Shipping Categories.

MAXIMUM ALLOWABLE WATTAGE: The maximum allowable wattages for analytical and test category waste are specified in the CH-TRAMPAC.

Attachment 2 – CH-TRU Waste Content Codes (continued)

CH-TRU Waste Content Codes

Rev. 7, June 2005

Small Quantity Site
List of Chemicals and Materials
in TRU Waste Content Codes

Content Code SQ 121/221

SOLID ORGANIC WASTE

GROUP 1:	ACIDS, MINERAL, NON-OXIDIZING (Constituents reacted prior to loading in payload containers)	T
GROUP 2:	ACIDS, MINERAL, OXIDIZING (Constituents reacted prior to loading in payload containers)	T
GROUP 3:	ACIDS, ORGANIC (Constituents reacted prior to loading in payload containers)	T
GROUP 4:	ALCOHOLS AND GLYCOLS	T
GROUP 8:	AZO COMPOUNDS, DIAZO COMPOUNDS, AND HYDRAZINES (Constituents reacted prior to loading in payload containers)	T
GROUP 10:	CAUSTICS (Constituents reacted prior to loading in payload container)	T
GROUP 11:	CYANIDES	T
GROUP 13:	ESTERS	T
GROUP 14:	ETHERS	T
GROUP 15:	FLUORIDES	T
GROUP 16:	HYDROCARBONS, AROMATIC	T
GROUP 17:	HALOGENATED ORGANICS	T
GROUP 18:	ISOCYANATES	T
GROUP 19:	KETONES	T
GROUP 21:	METALS, ALKALI AND ALKALINE EARTH, ELEMENTAL AND ALLOYS (Constituents reacted prior to loading in payload containers)	T
GROUP 22:	METALS OTHER ELEMENTAL AND ALLOYS IN THE FORM OF POWDERS, VAPORS OR SPONGES	T
GROUP 23:	METALS, OTHER ELEMENTAL AND ALLOYS, AS SHEETS, RODS, MOLDINGS, DROPS, ETC.	D
GROUP 24:	METALS AND METAL COMPOUNDS, TOXIC	D
GROUP 25:	NITRIDES	T
GROUP 28:	HYDROCARBON, ALIPHATIC, UNSATURATED	T
GROUP 29:	HYDROCARBON, ALIPHATIC, SATURATED	T
GROUP 30:	PEROXIDES AND HYDROPEROXIDES, ORGANIC (Constituents reacted prior to loading in payload containers)	T

Attachment 2 – CH-TRU Waste Content Codes (continued)

CH-TRU Waste Content Codes Rev. 7, June 2005

Small Quantity Site
List of Chemicals and Materials
in TRU Waste Content Codes

Content Code SQ 121/221
(Continued)

SOLID ORGANIC WASTE

OTHER ORGANICS	T
OTHER SOLIDIFICATION MATERIALS/ABSORBENT	
Diatomaceous Earth	M
Florco	M
Hydrated Aquaset II	D
Radsorb	M

Refer to Introduction for a description of the designations used in this chemical list.