

1. Title: Source Term Determination for Transuranic Package Transporter (TRUPACT) No. 157

2. Project File No.: NA

3. Index Codes:
Building/Type NA SSC ID TRUPACT No. 157 Site Area TAN/RWMC

4. Summary:

TRUPACT No. 157 was involved in a vehicle accident and returned to the Radioactive Waste Management Complex (RWMC). Internal TRUPACT sampling results indicate internal contamination exceeding 5,000 disintegrations per minute (dpm). The TRUPACT will be shipped from RWMC to the Test Area North (TAN) where the contents of the TRUPACT will be removed and examined. The shipment from RWMC to TAN will be in compliance with Department of Transportation (DOT) regulations. Following examination, the drums will be over packed and returned to RWMC. In order to ship the drums from TAN to RWMC, a transport plan will be required because the drums will not be shipped back to RWMC using DOT-compliant packaging. This EDF identifies the source term of the drums in order to prepare the transport plan.

Certified data from the Payload Assembly Transportation Certification Document (PATCD) was used to determine the source term of the 14-drum TRUPACT shipment. RADCALC software was also used to determine DOT shipping classification.

The total activity of all 14 drums is 2.833E12 Bq. The total activity per isotope of all 14 drums is:

Am241 4.449E11 Bq	Pu242 1.613E7 Bq
Pu238 1.712E10 Bq	U234 2.347E7 Bq
Pu239 5.560E11 Bq	U235 2.337E6 Bq
Pu240 1.233E11 Bq	U238 2.628E8 Bq
Pu241 1.692E12 Bq	

5. Review (R) and Approval (A) and Acceptance (Ac) Signatures:
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BACKGROUND

TRUPACT No. 157 was shipped from RWMC to WIPP as part of shipment number IN020271. Prior to reaching WIPP, the shipment was involved in a vehicle accident. The TRUPACT was sampled for internal contamination and levels exceeding 5,000 dpm were identified. The TRUPACT was returned to RWMC pending final resolution. A proposal to extract the contents from the TRUPACT was submitted to DOE and approved.

The plan is to ship the loaded TRUPACT from RWMC to TAN in accordance with DOT regulations. The payload will be removed from the TRUPACT and examined. Following examination, the payload drums will be over packed in either 85-gal overpack drums or standard waste boxes. The shipment of the payload from TAN to RWMC will require a transport plan because the material will not be transported using a DOT-approved package. This EDF identifies the source term of the drums that will be transported from TAN to RWMC as part of the TRUPACT No. 157 recovery.

DISCUSSION

Description of Material Contents

There are 14, 55-gal drums (containers) inside the TRUPACT. The drums contain filters and sludge identified with Item Description Codes (IDCs) 376, 001, 002, and 007. Detailed material descriptions of the IDCs follow.

IDC 376

This waste consists of glovebox air intake and exhaust HEPA filters. Filter sizes include 8 × 8 × 8 in., 8 × 8 × 4 in., and 12 × 12 × 6 in. Filter frames are constructed of either fire-retardant plywood or particle board and aluminum-based or chromized steel. The filter media is made of Nomex (glass and aromatic polyamide filters), fiberglass, or asbestos. This waste includes acid-, nonacid-, and solvent-contaminated filters. The waste may also contain limited amounts of combustible materials. Beginning in approximately 1989, acid- and nonacid-contaminated filters, and acid-contaminated filters were assigned IDC 342. Absolute drybox filters contaminated with plutonium above the economic discard limit were processed as IDC 338. Filters below the economic discard limit, which were wet or exposed to corrosive fumes, were processed as IDC 376.

Each absolute drybox filter removed from a glovebox was double contained in plastic bags and sealed with tape. Oil-Dri was added to any bags containing damp filters. Each bag containing a filter was assayed for plutonium content.

IDC 001

This sludge waste consists of immobilized materials generated from first-stage treatment operations. Liquids originating from recovery operations were made basic with sodium hydroxide to precipitate iron, magnesium, etc. The precipitate was filtered to produce a sludge which was scraped off the filter and placed in a 55-gal drum. Portland cement was placed on the bottom of the drum and may also have been added to the top of the drum.

The waste was allowed to contain up to 10% of another IDC other than that assigned to the container. Inspection of the sludge containers identified Kimwipes, leaded rubber gloves, rubber gloves, and bottles.

For the most part, Oil-Dry was the absorbent used through February 1982 and vermiculite was the predominant absorbent material used after February 1982. Cement was used throughout the duration of IDC 001 waste generation. Real-time radiography examinations indicate that quantities of absorbent can vary from expected quantities. In addition, some containers have contained a different than expected absorbent or contained no absorbent.

IDC 002

This sludge waste consists of immobilized materials generated from second-stage treatment operations. Liquids originating throughout the plant were treated in a variety of ways. The treated liquid was precipitated and the precipitate was filtered to produce a sludge, which was scraped off the filter and placed in a 55-gal drum. Portland cement and the sludge are layered throughout the drum.

The waste was allowed to contain up to 10% of another IDC other than that assigned to the container. Inspection of sludge containers identified Kimwipes, leaded rubber gloves, rubber gloves, and bottles. Acceptable knowledge sources indicate that up until 1973 items such as electric motors, bottles of residual liquid chemical wastes, mercury batteries, and small amounts of contaminated mercury in pint bottles may also be contained in this waste.

For the most part, Oil-Dry was the absorbent used through February 1982 and vermiculite was the predominant absorbent material used after February 1982. Cement was used throughout the duration of IDC 002 waste generation. Real-time radiography examinations indicate that quantities of absorbent can vary from expected quantities. In addition, some containers have contained a different than expected absorbent or contained no absorbent.

IDC 007

This sludge waste consists of sludges generated by liquid waste treatment that was either wet sludge dried in a dryer or a moist sludge mixed with Portland cement or a diatomite and Portland cement mixture.

The following is a list of items that have been identified in a small percentage of the wet sludge waste:

Item	Source
Inorganic liquids	AK-01-142
Lead-contaminated items	AK-01-152
Metals	AK-01-208
Miscellaneous plastics	AK-01-230
AK = Acceptable knowledge sources	

The metals identified have been evaluated for their potential to carry additional hazardous waste numbers, and no additional hazardous waste numbers are applicable.

2. The total activity of all 14 drums is 2.833E12 Bq (see Table 1).
3. The total activity of each drum based on RADCALC is (see Table 2):

IDRF004002790	0.4376 TBq (11.83 Ci)
IDRF004002801	0.4325 TBq (11.69 Ci)
IDRF004101890	0.4627 TBq (12.51 Ci)
IDRF004102254	0.4509 TBq (12.19 Ci)
IDRF004102263	0.4299 TBq (11.62 Ci)
IDRF074221338	0.009354 TBq (0.2528 Ci)
IDRF074700394	0.02188 TBq (0.5913 Ci)
IDRF074700411	0.003349 TBq (0.09051 Ci)
IDRF741201615	0.08369 TBq (2.262 Ci)
IDRF741201718	0.00501 TBq (0.1354 Ci)
IDRF741202088	0.01826 TBq (0.4936 Ci)
IDRF741202484	0.06815 TBq (1.842 Ci)
IDRF741204650	0.01863 TBq (0.5036 Ci)
IDRF741205405	0.3913 TBq (10.58 Ci)

4. All drums meet the definition of Type B radioactive material per DOT (see Table 2).
5. Two of the drums meet the criteria of LSA II and could be shipped in a strong tight container per 49 CFR 173.127(b)(3) (see Table 2).
6. Eight of the 14 drums are fissile excepted (see Table 2).

DOT Classification of Contents

The source term contents of the 14 drums are identified on the Payload Assembly Transportation Certification Document (PATCD), which is used as part of the WIPP transportation program. The Transportation Certification Official, who certifies the contents of the drums as part of the WIPP Quality Assurance Program, prepares this document. To determine the classification of the drums for transportation from TAN to RWMC, the PATCD for pack PK102013 was used.^a The isotopic content and weight of each of the 14 TRUPACT drums (containers), as identified in the PATCD, are listed in Table 1.

The source term data from the PATCD was entered into RADCALC, a software package approved by the INEEL to classify material for shipment in accordance with DOT regulations. The RADCALC program was prepared by Westinghouse Hanford and is currently being maintained by Duratek Federal Services under contract with DOE-Albuquerque. The program manipulates the source term data to determine the following DOT classification categories (see 49 CFR 173.403 for definitions) using A_1 and A_2 values in accordance with 49 CFR 173.433 and 173.435:

- Radioactive material
- Type A or Type B material
- Limited quantity material
- Highway route controlled quantity of material
- Low specific activity (LSA) I, II, or III material
- Fissile or fissile excepted material
- Reportable quantity material
- 95% isotopes

After performing the initial RADCALC determination, an independent verification was performed by reentry of all source term data and rerunning RADCALC. Table 2 lists RADCALC results and the DOT classification of each of the 14 drums shipped in TRUPACT No. 157.

RESULTS

Based on the source term data from the PATCD and the results of the RADCALC, the following was determined:

1. The total activity per isotope of all 14 drums is (see Table 1):

Am241	4.449E11 Bq
Pu238	1.712E10 Bq
Pu239	5.560E11 Bq
Pu240	1.233E11 Bq
Pu241	1.692E12 Bq
Pu242	1.613E7 Bq
U234	2.347E7 Bq
U235	2.337E6 Bq
U238	2.628E8 Bq

a. Pack PK102013 is the identification number assigned for the payload contained in TRUPACT No. 157.

Table 1. Payload Assembly Transportation Certification Document (PATCD) identification of isotopic content and weight of 14 drums (containers) shipped in TRUPACT No. 157.

Container ID	Mass (kg)	Isotopic Content (Bq)													Total		
		Am241	Pu238	Pu239	Pu240	Pu241	Pu242	U234	U235	U238	U238	U238	U238				
IDRF004002790	38.1	1.256E10	3.049E9	9.898E10	2.193E10	3.011E11	2.874E6	0	0	0	0	0	0	0	0	0	4.376E11
IDRF004002801	27.7	0	3.102E9	1.007E11	2.232E10	3.064E11	2.924E6	0	0	0	0	0	0	0	0	0	4.325E11
IDRF004101890	30.4	3.029E10	3.101E9	1.007E11	2.231E10	3.063E11	2.923E6	0	0	0	0	0	0	0	0	0	4.627E11
IDRF004102254	22.7	1.366E10	3.136E9	1.018E11	2.256E10	3.097E11	2.955E6	0	0	0	0	0	0	0	0	0	4.508E11
IDRF004102263	25.4	0	3.083E9	1.001E11	2.218E10	3.045E11	2.906E6	0	0	0	0	0	0	0	0	0	4.298E11
IDRF074221338	230.4	3.629E9	4.091E7	1.333E9	2.963E8	4.052E9	3.845E4	3.431E5	5.853E4	2.616E6	9.355E9						
IDRF074700394	234.1	9.153E9	9.096E7	2.963E9	6.588E8	9.009E9	8.548E4	4.624E5	6.910E4	4.019E6	2.188E10						
IDRF074700411	243.6	2.800E8	2.194E7	7.144E8	1.589E8	2.173E9	2.061E4	7.277E4	1.093E4	6.298E5	3.349E9						
IDRF741201615	212.7	7.995E10	2.665E7	8.681E8	1.930E8	2.640E9	2.505E4	1.079E6	1.660E5	9.137E6	8.369E10						
IDRF741201718	227.7	3.737E9	7.792E6	2.538E8	5.644E7	7.718E8	7.323E3	1.228E7	5.788E5	1.699E8	5.010E9						
IDRF741202088	191.9	1.398E10	3.045E7	9.918E8	2.205E8	3.016E9	2.862E4	2.561E6	4.109E5	2.084E7	1.826E10						
IDRF741202484	180.5	5.536E10	9.100E7	2.964E9	6.591E8	9.014E9	8.552E4	5.720E6	7.539E5	5.477E7	6.815E10						
IDRF741204650	243.6	8.914E9	6.948E7	2.263E9	5.032E8	6.882E9	6.530E4	4.020E5	1.122E5	8.751E5	1.863E10						
IDRF741205405	199.6	2.134E11	1.273E9	4.145E10	9.217E9	1.260E11	1.196E6	5.474E5	1.765E5	0	3.914E11						
Total	2108.3	4.449E11	1.712E10	5.560E11	1.233E11	1.692E12	1.613E7	2.347E7	2.337E6	2.628E8	2.833E12						

Table 2. RADCALC results for DOT classification of 14 drums (containers) shipped in TRUPACT No. 157.

Container ID	Radioactive	Shipment Type	Total Activity TBq (Ci)	L-5A II	Highway Route Controlled	Fissile (F) or Fissile Excepted (FE)	Reportable Quantity	95% Isotopes
IDRF004002790	Yes	B	0.4376 (11.83)	No	No	F	Yes	Am241, Pu239, Pu240, Pu241
IDRF004002801	Yes	B	0.4325 (11.69)	No	No	F	Yes	Pu239, Pu240, Pu241
IDRF004101890	Yes	B	0.4627 (12.51)	No	No	F	Yes	Am241, Pu239, Pu240, Pu241
IDRF004102254	Yes	B	0.4509 (12.19)	No	No	F	Yes	Am241, Pu239, Pu240, Pu241
IDRF004102263	Yes	B	0.4299 (11.62)	No	No	F	Yes	Pu239, Pu240, Pu241
IDRF074221338	Yes	B	0.009354 (0.2528)	No	No	FE	Yes	Am241, Pu239, Pu240
IDRF074700394	Yes	B	0.02188 (0.5913)	No	No	FE	Yes	Am241, Pu239, Pu240
IDRF074700411	Yes	B	0.003349 (0.09051)	Yes	No	FE	Yes	Am241, Pu239, Pu240, Pu241
IDRF741201615	Yes	B	0.08369 (2.262)	No	No	FE	Yes	Am241
IDRF741201718	Yes	B	0.00501 (0.1354)	Yes	No	FE	Yes	Am241, Pu239
IDRF741202088	Yes	B	0.01826 (0.4936)	No	No	FE	Yes	Am241, Pu239
IDRF741202484	Yes	B	0.06815 (1.842)	No	No	FE	Yes	Am241, Pu239
IDRF741204650	Yes	B	0.01863 (0.5036)	No	No	FE	Yes	Am241, Pu239, Pu240
IDRF741205405	Yes	B	0.3913 (10.58)	No	No	F	Yes	Am241, Pu239