TWCP-02783

RECORDS SUBMITTAL

INSTRUCTIONS: This form is prepared by the record source when submitting individual records, batch data reports, or a records package to the RMDC. For records packages, a Table of Contents (TOC) must also be submitted. Each record submitted requires a complete form.

MANDATORY: X By knowledge of process, I certify that the record(s) have no radioactive contamination.
Signature: MaryAnn Garcia

RECORD SOURCE: X TWCP ___ WCRRF ___ RAMROD ___ RANT ___ CST-

Submittal Date: 9/29/99 Z-Number: 098639 Name/Org.: E-ET

Originator: — Organization: —

TYPE OF RECORD/ACTION TO BE TAKEN

X Individual Record ___ Batch Report ___ Records Package (+ TOC)

X New ___ Revision* ___ Addition* ___ Supersedes*

* Record Barcode Number: _____ *Review Cycle (if applicable): ___ Yes ___ No

RECORD ID NUMBER: (e.g., memo symbol number, procedure (include revision), batch report number, unique record identifier if applicable):

LA-UR-86-2932

RECORD DATE: 9/86 **PHYSICAL PAGE COUNT:** 86 ___ **SINGLE SIDED** ___ **DOUBLE SIDED**

WBS Number: _____ **Category Number: (back of page)** 07

RECORD TITLE, SUBJECT, AND/OR KEYWORDS:

1986 TRU Waste Workoff

Keywords: AK Summary Report for TA-50-19

RECORD CENTER USE ONLY

✓ Accepted Date: 9/30/99 ___ Return Date: _____

Signature: Louise Garcia Resubmitted: _____

(Subject to change prior to scheduled review cycle).

TABLE 1
Record Category Number
(Subject to change prior to review cycle)

Category Number	Description	Category Number	Description
01	Field Sampling Data Forms	25	Audio/Video (RTR, Visual, Etc.)
02	Field and Laboratory Chain-of-Custody Forms	26	General Correspondence (If applicable, Categorize according to content.)
03	Test Facility and Laboratory Analytical Data Reports	27	Transportation
04	Summary Data Packages/Batch Data Reports	28	Records Management (Requests, Guidance Documents, Etc.)
05	Sampling Plans	29	Regulatory/Legal (If applicable, categorize according to content)
06	Data Reduction, Validation, Reconciliation, and Reporting Documentation		
07	Acceptable Knowledge Documentation/Summary Reports		
08	Certification Documentation		
09	Waste Stream Characterization/ Profile Forms		
10	Nonconformance/Corrective Action Reporting Documentation		
11	Variance Documentation		
12	Assessment/Audit/Surveillance Documentation		
13	Technical Reports		
14	TRU PACT-II Operations		
15	Performance Demonstration Program (PDP)/Methods Performance Documentation		
16	Sampling Equipment Certifications		
17	Calculations and Related Software Documentation		
18	Training/Qualification Documentation		
19	QAPP (CAO)/QAPjP (Sites) Documentation (All Revisions)		
20	Calibration Documentation		
21	Analytical Raw Data		
22	Procurement Documentation / Certificates of Compliance		
23	QA Procedures (All Revisions)		
24	Technical Implementing Procedures (All Revisions)		

1986 TRU Waste Workoff

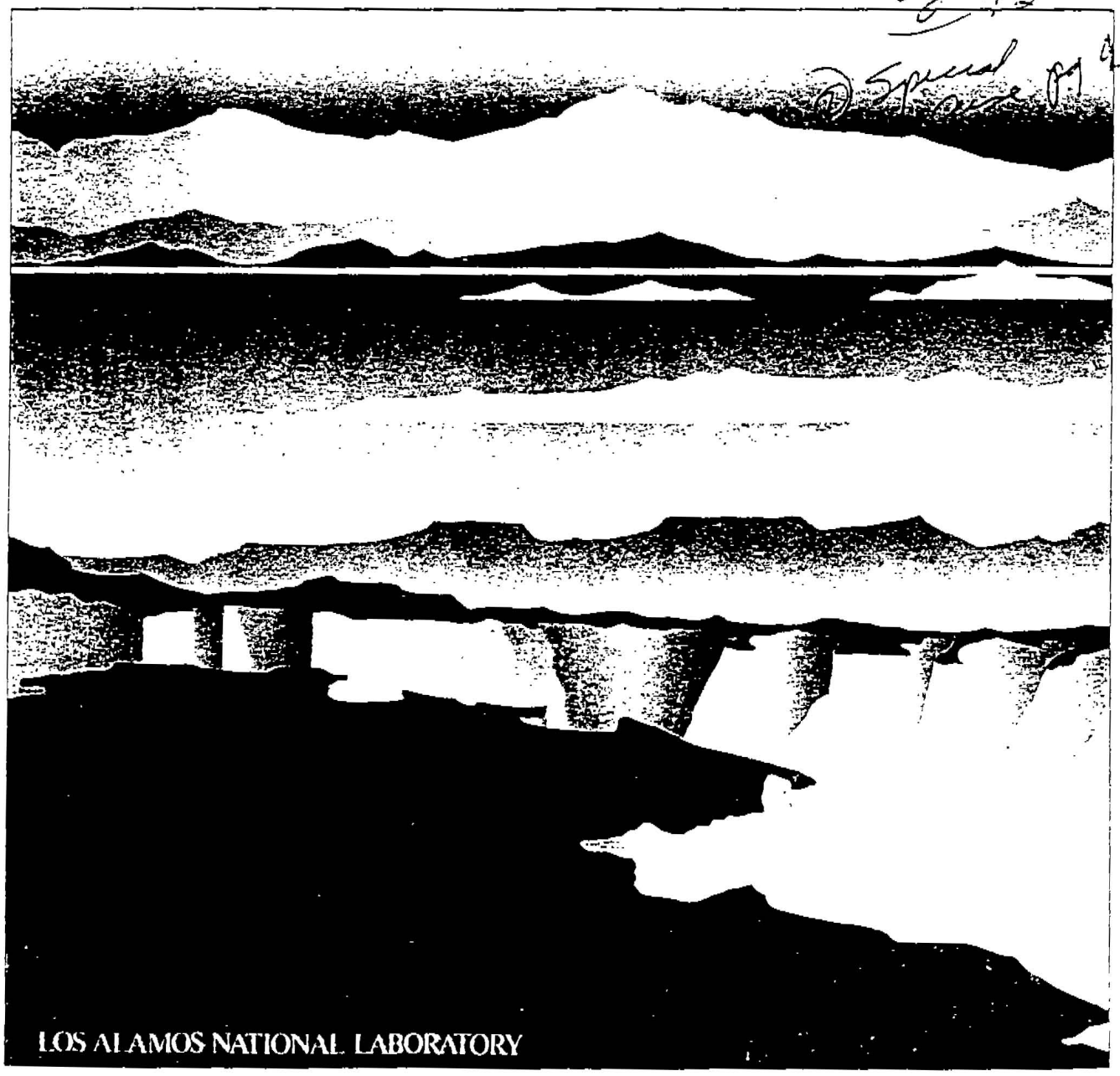
LA-UR-86-2932

FINAL TRU WASTE INVENTORY WORK-OFF PLAN

LOS ALAMOS NATIONAL LABORATORY

AUGUST 1986
(REVISED: DECEMBER 15, 1986)

BY
J. L. WARREN
A. E. DROSS



LA-UR-862932

FINAL TRU WASTE INVENTORY WORK-OFF PLAN

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AUGUST 1986

(Revised: December 15, 1986)

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Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

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ABSTRACT

This document presents an assessment of the current strategy to develop new operations and facilities at the Los Alamos National Laboratory (Los Alamos) to retrieve, process, certify, and transport defense transuranic (TRU) wastes to the Department of Energy's (DOE's) Waste Isolation Pilot Project (WIPP) in southeastern New Mexico. This Final Inventory Work-Off Plan (IWOP) will cover all TRU stored and newly-generated (NG) contact-handled (CH), remote-handled (RH), and special-case (SC) wastes expected to be generated, or currently being stored, at Los Alamos through the year 2015. The strategies and actions proposed in this IWOP involve the modification of two existing TRU waste work-off facilities in Technical Area (TA) 50, and the construction of five new facilities at the present TA-54. The activities leading to certification of wastes to be shipped to the WIPP will be in compliance with the quality assurance requirements of the approved Los Alamos TRU Waste Certification Plan and its waste form specific attachments. Barring unforeseen programmatic, funding, and/or political changes, there will be little difficulty in meeting the schedules and strategies with the resources as defined in this IWOP.

1.0 INTRODUCTION

The defense transuranic (TRU) wastes that have been generated and placed into retrievable storage at Los Alamos since 1971 and newly-generated (NG) TRU wastes will be sent to the Waste Isolation Pilot Plant (WIPP) for permanent disposal as per current Department of Energy (DOE) planning. Prior to shipment to the WIPP, however, all TRU wastes must be certified according to the Los Alamos TRU Waste Certification Plan and its attachments as meeting the WIPP Waste Acceptance Criteria (WAC). This report defines the facilities that must be built or modified, funding requirements, and schedules involved in the overall plan for certification of these Los Alamos TRU wastes and the eventual shipment of these wastes to the WIPP.

Contact-handled (CH) TRU wastes are generated routinely at Los Alamos as a result of plutonium processing and research and development activities. Through 1985, a total of approximately 7028 m^3 (248 092 ft^3) of this waste had been placed into retrievable storage at Los Alamos. A total remote-handled (RH) TRU inventory of 29 m^3 (1015 ft^3) existed as of the end of 1985.

The schedules and milestones derived in this plan are in agreement with the "Long Range Master Plan for Defense Transuranic Waste Management" dated January 1986. All currently stored CH-TRU wastes that reasonably can be, will be certified by the end of Fiscal Year (FY) 97, resulting in an inventory of approximately 4771 m^3 (168 416 ft^3) of wastes to be shipped to

the WIPP. Shipment of these retrieved wastes together with the NG and the inventory of pre-certified wastes accumulated during the period of 1986 through FY 88, will begin in FY 92, and will continue at a constant rate of 864 m^3/yr (30 508 ft^3) through FY 02. Certified NG wastes will be shipped to the WIPP on a continuous basis beginning in FY 89.

A key aspect of the overall planning strategy is the integration of NG waste with stored waste where possible and practical. This approach is designed to streamline the management of both programs and increase the service obtained from new facilities thus optimizing the dollar spent. The operations and design concepts being developed will provide a basis for evaluating the proposed facilities outlined in the IWOP. Safety will be enhanced and operating costs will be reduced by minimizing the number of vehicles entering and exiting the radioactive waste burial/storage area at TA-54, and minimizing waste transport on public access roads during work-off operations. Operational efficiency will be maintained in the regular shipping of two TRUPACTs per week through greater flexibility in maintaining a constant manpower demand by the rotation of personnel among work-off operations and with planned campaign rates and campaign scheduling. The concepts of greatest concern with respect to locating new facilities are those which stress minimizing the movement and handling of wastes during work-off operations.

For CH-TRU waste the new facilities, modifications to existing facilities and equipment required to implement the plan and to meet the WIPP WAC will cost a total of $6920K with the first $500K provided in FY 84 for the modifications to the Size Reduction Facility (SRF) and the Treatment Development Facility (TDF). All costs are in constant FY 86 dollars except for prior years which are in actual year-of-expenditure dollars. The SRF facility, which reduces bulky metallic wastes (approximately 19.5% of the total waste to be processed and certified), and the TDF which incinerates a majority of combustible wastes (approximately 16.8% of the total waste to be processed and certified), are major elements in the Los Alamos plan. The new facility requirements include a TRU Waste Preparation Facility (FY 86), a Nondestructive Analysis-Nondestructive Examination (NDA-NDE) Facility (FY 88), a Transportation Facility (FY 88), and a combined Corrugated Metal Pipe (CMP) Saw Facility (FY 91) and Processing Facility (FY 93). In addition, we anticipate utilizing the Los Alamos developed mobile NDA-NDE systems, where possible, for some stored CH-(e.g. crates) and RH-waste as it would not be effective to provide such facilities on a permanent basis for the relatively small volumes of waste involved. Operational costs for the work-off program are estimated to total $16 291K through FY 97 when all of the CH stored waste is processed and certified. An additional $1260K is required for continuing transportation operations through FY 02.

No significant problems are anticipated at this time in accomplishing the work-off of CH-TRU wastes. It is anticipated that only some very small quantities of waste will be found impractical to certify; these will be evaluated on a "case-by-case" basis as required. On-site greater confinement disposal (GCD) is the primary alternate being considered.

Only a small volume of RH-TRU waste that requires certification has been accumulated. Due to a variety of existing package characteristics, this waste will be evaluated on a "package-by-package" basis to determine the practicality of and possible means for certification. A planned closeout of the Los Alamos RH-TRU hot-cell facility is scheduled to begin in FY 87. Associated with this closeout activity we have proposed the certification and preparation for the WIPP of all existing and NG RH-TRU wastes. As the waste volume is small, a cost of approximately $765K is identified currently for this effort.

Overall there is excellent agreement of milestones in this plan with the milestones identified in earlier DOE planning documents.

The certification for most NG wastes will begin in 1986. Thus, any further additions to stored waste inventory will be small.

2.0 WASTE CHARACTERIZATION

Data concerning existing and anticipated Los Alamos contact-handled (CH) and remote-handled (RH) transuranic (TRU) wastes are contained in the following Tables 1 through 11. Supplemental waste form data are provided in Appendix A, and descriptions of current waste packaging are provided in Appendix B. The above tables are in the formats supplied by the Department of Energy (DOE) Joint Integration Office (JIO). Much of the data provided are only estimates; however, in several instances it was not considered practical to attempt to give an estimate. Explanations and clarifications of these data tables are provided in the following sections.

2.1 Existing TRU Waste Records System

A data record on each package of currently stored TRU waste is contained in a computer data base maintained by the Waste Management Group. The data entry form used - a Radioactive Solid Waste Disposal Record form - is shown in Figure 1. Each TRU waste package has affixed to it a unique retrievable serial number which can be utilized to relate the stored data record to the package.

Each data record includes a waste code which identifies the waste matrix. A listing of currently valid waste codes is presented in Figure 2. Analyses of these data records, to the extent possible, provided the basis for completing the requested Tables 1 through 11.

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

RADIOACTIVE SOLID WASTE DISPOSAL RECORD

NOTE: Read instructions on back carefully before completing this form

1. Form Number	HSE-7 Waste Management
S 8 5 3881	Ext. 6095, MS J592

2. Date (M M D D Y Y)	3. Retrievable Serial Number	4. Origin of Waste: Group	TA	Building	Wing	Room	5. Waste Code

6. Waste Description

7. Numbers of Waste Packages: Plastic Bags	Card-Board Boxes	Drums: No.	Drums: Gal.	Wooden Crates: No	Wooden Crates: Volume-ft³	8. Gross Volume: Amount	(M = meter³, F = foot³, G = gallon)	9. Package Radiation at: Surface (mr/hr)	1 Meter (mr/hr)

10. Gross Weight: Amount	(K = kilogram, P = pound, T = ton)	11. Additional Description of Packaging and Packaging Materials

12. Radionuclide Content — SS Materials Write-Off

Nuclide	Amount	±	(C = curie, M = gram)	Error on Amount	±	Amount Determined By: (A = analysis, M = measurement, E = estimate)	Account	Project Code
		E			E			
		E			E			
		E			E			
		E			E			
		E			E			
		E			E			

APPROVALS

Waste Generator *(Print Name Here)*	HSE-1/-10/-11 Area Representative *(Print Name Here)*	Additional Signatures *(Optional)*
Signature certifies that waste is in accordance with all applicable disposal requirements.	Signature certifies that waste package or shipment is safe to handle and transport.	

13. Date Disposed (M M D D Y Y)	14. Disposal/Storage Location: Area	Shaft	Pit	Post(s)	Layer	Pos.	15. Shaft Surface Dose (mr/hr)

HSE-7 Waste Management Representative *(Print Name Here)*	Received	Logbook	Computer	Verified
Signature certifies that waste acceptance criteria and all disposal requirements were met. *(Signature)*	Date	Date	Date	Date

Form Number HS 10-2A (3/86)

8

FIGURE 1. Radioactive Solid Waste Disposal (RSWD) Record Form

Los Alamos National Laboratory
Waste Management Group HSE-7

VALID WASTE CODES

CODE	WASTE MATERIAL DESCRIPTION
A-10	Graphite
A-14	Combustible Room Decon. Waste
A-15	Mixed Cellulosics
A-16	Plastic Materials
A-17	Rubber Materials
A-18	Mixed Paper, Plastic, Rubber, etc.
A-19	Mixed Combustible/Noncombustible Trash
A-20	Hydrocarbon Oils
A-21	Silicon Base Oils
A-25	Leached Process Residues
A-26	Evaporator Bottoms (Salts)
A-27	Nitrate Salts
A-28	Chloride Salts
A-29	Hydroxide Cake
A-30	PN Equipment
A-31	Non-PN Equipment
A-32	PN Size Reduced Equipment (SRF Only)
A-33	Non-PN Size Reduced Equipment (SRF Only)
A-35	Combustible Building Debris
A-36	Noncombustible Building Debris
A-40	Combustible Hot-Cell Waste
A-41	Noncombustible Hot-Cell Waste
A-45	Uranium Chips and/or Turnings
A-46	Skull and Oxide
A-47	Slag and Porcelain Crucibles
A-50	Metal Crucibles, Scrap, Dies
A-51	Precious Metals
A-52	Other Scrap Metals
A-55	Filter Media
A-56	Filter Media Residue
A-60	Other Combustibles
A-61	Other Noncombustibles
A-65	Animal Tissue
A-68	Asbestos Only
A-69	Asbestos Contaminated Debris
A-70	Chemical Waste
A-71	Be
A-72	Hg
A-73	Counting Vials and Solution
A-74	Ion Exchange Resin
A-75	Chemical Treatment Sludge
A-76	Cement Paste
A-77	Vermiculite
A-80	Sources
A-85	Firing Point Residues
A-90	Contaminated Soil
A-95	Glass
A-99	Unidentified Material (TA-54 personnel use only)

(12/85)

FIGURE 2. Valid Los Alamos Waste Codes

TABLE 1

(1) STORED WASTE EXPECTED TO BE CERTIFIABLE WITHOUT PROCESSING

	NUMBER OF CONTAINERS	VOLUME OF CONTAINER M^3	AVE. PACK. EFF. OF CONTAINERS	VOLUME OF WASTE METERS^3	VOLUME OF WASTE CONT. METERS^3	RAD LEVEL AT CONTACT (ACTIVITY) MAXIMUM RAD LEVEL mr/hr	AVERAGE RAD LEVEL mr/hr	TOTAL Pu CURIES	TOTAL OF ALL ACTIVITY (CURIES)	TOTAL OF TRU-ALPHA CURIES	% LESS THAN 100 nci/gram
CH-WASTE											
DRUMS											
GAL-30	274	1.078E-01	1.0	2.95E+01	2.95E+01	1.00E+02	2.00E+00	1.44E+02	1.44E+02	4.10E+01	0.0
GAL-55	15245	2.037E-01	1.0	3.11E+03	3.11E+03	2.00E+02	6.00E+00	1.72E+05	1.72E+05	2.46E+04	4.4
GAL-83	10	3.142E-01	0.67	2.10E+00	3.10E+00	8.00E+00	2.00E+00	4.00E-01	4.00E-01	4.00E-01	0.0
BOXES											
74.5"X50.5"X38.5"	3	4.205E+00	1.0	1.26E+01	1.26E+01	1.00E+01	1.00E+00	7.80E+00	7.80E+00	7.80E+00	0.0
88"X54"X54"											
112"X68"X77"	8	2.317E+00	1.0	1.85E+01	1.85E+01	1.00E+01	1.00E+00	4.20E+01	4.20E+01	1.50E+01	0.0
68"X54"X38.5"											
88"X48"X48"											
THREE METER CUBED											
NON-STANDARD BOX*											
BINS											
H III											
H-9											
120 CU FT BIN											
Concrete Casks	718	4.724E-01	0.24	8.14E+01	3.39E+02	2.50E+02	5.00E+00	1.07E+05	1.07E+05	1.05E+05	0.0
3ft Sphere	3	4.00E-01	1.0	1.20E+00	1.20E+00	0.00E+00	0.00E+00	2.72E+01	2.72E+01	4.30E+00	0.0
RH-WASTE											
ONE GALLON											
FIVE GALLON											
THIRTY GAL											
FIFTY FIVE GAL											
CAN 12"X60"											
CYLIND. 1'X 6'											
FIVE CUBIC FT											
LONG RH-CANISTER											
SHORT RH-CANISTER											
2.72-gal can	116	1.030E-02	0.37	4.40E-01	1.20E+00	1.40E+06	2.00E+05	2.17E+02	6.02E+02	3.00E+01	0.0

TABLE 1 (cont.)

(1) STORED WASTE EXPECTED TO BE CERTIFIABLE WITHOUT PROCESSING

	WEIGHT DIST.						
	TOTAL WEIGHT Kgs	AVERAGE DENSITY Kgs/m^3	AVERAGE HEAT OUTPUT WATTS/M^3	FINES CONTENT (YES/NO)	NON-RAD HAZARDOUS MATERIAL	~~GG~~ MATERIAL DESIGNATION	ISOTOPIC CONTRIBUTION
CH-WASTE							
DRUMS							
GAL-30	9.20E+03	3.12E+02	5.00E-02	no	no	Pu239,240	100%
GAL-55	1.88E+06	6.05E+02	2.00E-01	no	no	Pu239,240	100%
GAL-83	2.42E+03	1.15E+03	5.00E-03	no	no	Pu239,240	100%
BOXES							
74.5"X50.5"X38.5"						Pu238	87%
88"X54"X54"	4.10E+03	3.25E+02	2.00E-02	no	yes	Pu239,240	13%
112"X60"X77"						Pu238	26%
68"X54"X38.5"	7.17E+03	3.87E+02	3.00E-02	no	yes	Pu239,240	74%
88"X48"X48"							
THREE METER CUBED							
NON-STANDARD BOX*							
BINS							
H III							
H-4							
120 CU FT BIN							
Concrete Casks	2.80E+04*	3.44E+02	5.00E+01	no	no	Pu238	100%
3 ft Sphere	1.90E+03	1.58E+03	1.30E-01	no	no	Pu239,240	100%
RH-WASTE							
ONE GALLON							
FIVE GALLON							
THIRTY GAL							
2.72-gal can	1.947E+03	4.42E+03	4.82E+01	no	no	Pu53	25% Fissile Material Mass
						U36	75%
						Pu53	36% Total Activity
						MFP/MAP	64%

*Weight of waste and inner drum - cask weight of approx. 750 kg ea. not included.

TABLE 2

(*) STORED WASTE NOT EXPECTED TO BE CERTIFIABLE WITHOUT REPROCESSING

	NUMBER OF CONTAINERS	VOLUME OF CONTAINER M^3	AVE. PACK. EFF. OF CONTAINERS	VOLUME OF WASTE METERS^3	VOLUME OF WASTE CONT. METERS^3	RAD LEVEL AT CONTACT (ACTIVITY) MAXIMUM RAD LEVEL mr/hr	AVERAGE RAD LEVEL mr/hr	TOTAL Pu CURIES	TOTAL OF ALL ACTIVITY (CURIES)	TOTAL OF TRU-ALPHA CURIES	% LESS THAN 100 nci/gram
CH-WASTE											
DRUMS											
GAL-30	239	1.078E-01	1.0	2.58E+01	2.58E+01	4.50E+01	1.00E+00	3.01E+03	3.00E+03	4.90E+02	0.0
GAL-55	2025	2.037E-01	1.0	4.13E+02	4.13E+02	2.00E+02	5.00E+00	9.08E+04	9.08E+04	1.03E+04	0.0
GAL-MISC	6	9.90E+00*	1.0	9.90E+00	9.90E+00	0.00E+00	0.00E+00	NA	NA	NA	0.0
GAL-80	1	3.00E-01	1.0	3.00E-01	3.00E-01	0.00E+00	0.00E+00	NA	NA	NA	0.0
BOXES											
74.5"X50.5"X30.5" 88"X54"X54" 112"X68"X77" 68"X54"X38.5" 88"X48"X48" THREE METER CUBED NON-STANDARD BOX*	390	2.512E+03*	1.0	2.512E+03	2.512E+03	3.00E+02	4.40E+00	3.62E+03	3.62E+03	3.27E+03	7.0
BINS											
H III H-4 120 CU FT BIN											
CHP	158	2.80E+00	1.0	4.42E+02	4.42E+02	NA	NA	4.69E+02	1.05E+04	1.05E+04	0.0

RH-WASTE

ONE GALLON
FIVE GALLON
THIRTY GAL
FIFTY FIVE GAL
CAN 12"X60"
CYLIND. 1'X 6'
FIVE CUBIC FT
LONG RH-CANISTER
SHORT RH-CANISTER

none

NA - data not available.
* - total volume of listed number of containers.

TABLE 3 (cont.)

(1) NEWLY GEN. WASTE EXPECTED TO BE CERTIFIABLE WITHOUT PROCESSING

(1986 - 2015)

	WEIGHT DIST.						
	TOTAL WEIGHT Kgs	AVERAGE DENSITY Kgs/m^3	AVERAGE HEAT OUTPUT WATTS/M^3	FIBES CONTENT (YES/NO)	NON-RAD HAZARDOUS MATERIAL	XXX XXXXXXXX XXXXXXXXX	ISOTOPIC CONTRIBUTION
CH-WASTE							
DRUMS							
GAL-30 GAL-55	6.25E+06	6.00E+02	2.00E+00	no	no.	Am241 Pu239,240	11% 89%
BOXES							
74.5"X50.5"X38.5" 88"X54"X54" 112"X60"X77" 60"X54"X38.5" 88"X48"X48" THREE METER CUBED NON-STANDARD BOX*	8.00E+05	6.00E+02	2.00E-01	no	yes	Pu239,240	100%
BINS							
B III H-4 120 CU FT BIN							
RH-WASTE							
ONE GALLON FIVE GALLON THIRTY GAL FIFTY FIVE GAL CAN 12"X60" CYLIND. 1'X 6' FIVE CUBIC FT LONG RH-CANISTER SHORT RH-CANISTER	9.944E+03	3.40E+03	4.40E-03	no	no	Pu53 U36 Pu53 MFP/MAP	25% 75% 5% 95%

Fissile Material Mass

Total Activity

TABLE 4

(A) NEWLY GEN. WASTE NOT EXPECTED TO BE CERTIFIABLE WITHOUT PROCESSING

(1986 - 2015)

	NUMBER OF CONTAINERS	VOLUME OF CONTAINER M^3	AVE. PACK. EFF. OF CONTAINERS	VOLUME OF WASTE METERS^3	VOLUME OF WASTE CONT. METERS^3	RAD LEVEL AT CONTACT (ACTIVITY) MAXIMUM RAD LEVEL mr/hr	AVERAGE RAD LEVEL mr/hr	TOTAL Pu CURIES	TOTAL OF ALL ACTIVITY (CURIES)	TOTAL OF TRU-ALPHA CURIES	% LESS THAN 100 nci/gram
CH-WASTE											
DRUMS											
GAL-30											
GAL-55	480	2.082E-01	1.0	1.00E+02	1.00E+02	1.00E+02	5.00E+00	2.50E+04	2.50E+04	3.00E+03	0.0
BOXES											
74.5"X50.5"X38.5"											
80"X54"X54"											
112"X68"X77"											
68"X54"X38.5"											
88"X48"X48"											
THREE METER CUBED NON-STANDARD BOX*	190	1.74E+03*	1.0	1740.0	1740.0	1.00E+02	5.00E+00	2.00E+03	2.00E+03	3.00E+02	0.0
BINS											
H III											
H-4											
120 CU FT BIN											
H-WASTE											
ONE GALLON											
FIVE GALLON	none										
THIRTY GAL											
FIFTY FIVE GAL											
CAN 12"X60"											
CYLIND. 1'X 6'											
FIVE CUBIC FT											
LONG RH-CANISTER											
SHORT RH-CANISTER											

* - total volume of listed number of containers.

TABLE 4 (cont.)
(4) NEWLY GEN. WASTE NOT EXPECTED TO BE CERTIFIABLE WITHOUT PROCESSING

(1986 - 2015)

	WEIGHT DIST.						
	TOTAL WEIGHT Kgs	AVERAGE DENSITY Kgs/m^3	AVERAGE HEAT OUTPUT WATTS/M^3	FINES CONTENT (YES/NO)	NON-RAD HAZARDOUS MATERIAL	XXX MATERIAL DESIGNATION	ISOTOPIC CONTRIBUTION
H-WASTE							
DRUMS							
GAL-30 GAL-55	1.00E+05	1.00E+03	1.00E+00	yes	yes	Pu239,240	100%
BOXES							
74.5"X50.5"X38.5" 88"X54"X54" 112"X68"X77" 68"X54"X38.5" 88"X48"X48" THREE METER CUBED						Pu239,240	90%
NON-STANDARD BOX*	2.16E+05	1.50E+02	6.00E-03	no	yes	Pu238	10%
BINS							
H III H-4 120 CU FT BIN							
I-WASTE							
ONE GALLON FIVE GALLON THIRTY GAL FIFTY FIVE GAL CAN 12"X60" CYLIND. 1'X 6' FIVE CUBIC FT LONG RH-CANISTER SHORT RH-CANISTER		none					

TABLE 5

(5) SOFT WASTE THAT WILL BECOME AVAILABLE FOR SHIPMENT

(1986-2015)

	NUMBER OF CONTAINERS	VOLUME OF CONTAINER M^3	AVE. PACK. EFF. OF CONTAINERS	VOLUME OF WASTE METERS^3	VOLUME OF WASTE CONT. METERS^3	RAD LEVEL AT CONTACT: MAXIMUM RAD LEVEL mr/hr	RAD LEVEL AT CONTACT: AVERAGE RAD LEVEL mr/hr	NUMBER AT EACH LEVEL (mr/hr): UP TO 10	10 TO 100	100 TO 1K	1K TO 100K	100K TO 1000K
CH-WASTE												
DRUMS												
GAL-30 GAL-55	9000	2.082E-01	1.0	1.87E+03	1.87E+03	2.00E+02	5.00E+00	8500	450	50	0	0
BOXES												
74.5"X50.5"X38.5" 88"X54"X54" 112"X68"X77" 60"X54"X38.5" 88"X48"X48" THREE METER CUBED NON-STANDARD BOX"												
BINS												
H III H-B 120 CU FT BIN												
RH WASTE												
ONE GALLON FIVE GALLON THIRTY GAL FIFTY FIVE GAL CAN 12"X60" CYLIND. 1'X 6' FIVE CUBIC FT LONG RH-CANISTER SHORT RH-CANISTER				none								

TABLE 5 (cont.)

(5) SOFT WASTE THAT WILL BECOME AVAILABLE FOR SHIPMENT

(1986-2015)

	(ACTIVITY)			NUMBER AT EACH Pu CURIE LEVEL										
	TOTAL Pu CURIES	TOTAL OF ALL ACTIVITY (CURIES)	TOTAL OF TRU-ALPHA CURIES	UP TO .6	.6 TO 2	2 TO 5	5 TO 10	10 TO 20	20 TO 84	84 TO 100	100 TO 1X	% LESS THAN 100 nci/gram	AVERAGE HEAT OUTPUT WATTS/CFT	FINES CONTENT LBS/FT
CH-WASTE														
DRUMS														
GAL-30														
GAL-55	1.00E+05	1.00E+05	5.00E+04	3200	1700	1250	1000	1000	500	50	300	0.0	1.0	no
BOXES														
74.5"X50.5"X38.5"														
80"X54"X54"														
112"X60"X77"														
68"X54"X38.5"														
88"X48"X48"														
THREE METER CUBED														
NON-STANDARD BOX*														
BINS														
M III														
M-4														
120 CU FT BIN														
RH WASTE														
ONE GALLON														
FIVE GALLON														
THIRTY GAL														
FIFTY FIVE GAL			none											
CAN 12"X60"														
CYLIND. 1'X 6'														
FIVE CUBIC FT														
LONG RH-CANISTER														
SHORT RH-CANISTER														

TABLE 5 (cont.)

(5) SOFT WASTE THAT WILL BECOME AVAILABLE FOR SHIPMENT

(1986-2015)

	NON-RAD HAZARDOUS MATERIAL	WEIGHT DIST. TOTAL WEIGHT Kgs	AVERAGE DENSITY Kgs/m^3	NUMBER AT EACH WEIGHT (Kgs) UP TO 180	180 TO 360	360 TO 680	680 TO 1360	1360 TO 2270	2270 TO 3180	3180 TO 5450	5450 TO 7700	7700 TO 11350	XXXX XXXXXXXXXX	ISOTOPIC CONTRIBUTION
CH-WASTE														
DRUMS														
GAL-30													Pu238	50%
GAL-55	no	5.00E+05	2.67E+02	9000	0	0	0	0	0	0	0	0	Pu239,240	50%
BOXES														
74.5"X50.5"X38.5"														
88"X54"X54"														
112"X68"X77"														
60"X54"X38.5"														
88"X48"X48"														
THREE METER CUBED														
NON-STANDARD BOX*														
BINS														
II III														
II-9														
120 CU FT BIN														
RH WASTE														
ONE GALLON														
FIVE GALLON														
THIRTY GAL														
FIFTY FIVE GAL														
CAN 12"X60"														
CYLIND. 1'X 6'														
FIVE CUBIC FT														
LONG RH-CANISTER														
SHORT RH-CANISTER														

none

TABLE 6
(G) HARD WASTE THAT WILL BECOME AVAILABLE FOR SHIPMENT

(1986-2015)

	NUMBER OF CONTAINERS	VOLUME OF CONTAINER M^3	AVE. PACK. EFF. OF CONTAINERS	VOLUME OF WASTE METERS^3	VOLUME OF WASTE CONT. METERS^3	RAD LEVEL AT CONTACT MAXIMUM RAD LEVEL mr/hr	RAD LEVEL AT CONTACT AVERAGE RAD LEVEL mr/hr	NUMBER AT EACH LEVEL (mr/hr) UP TO 10	10 TO 100	100 TO 1K	1K TO 100K	100K TO 1000K
CH-WASTE												
DRUMS												
GAL-30												
GAL-55	48521	2.082E-01	1.0	1.01E+04	1.01E+04	2.00E+02	5.00E+00	28931	15000	5000	0	0
BOXES												
74.5"X50.5"X38.5"												
88"X54"X54"	10	4.205E+00	1.0	4.20E+01	4.20E+01	2.00E+01	5.00E+00	5	5	0	0	0
112"X68"X77"												
68"X54"X10.5"	1000	2.317E+00	1.0	2.32E+03	2.32E+03	2.00E+02	5.00E+00	900	100	0	0	0
88"X48"X80"												
THREE METER CUBED												
NON-STANDARD BOX"												
BINS												
H III												
H-4												
120 CU FT BIN												
RH WASTE												
ONE GALLON												
FIVE GALLON												
THIRTY GAL												
FIFTY FIVE GAL												
CAN 12"X60"												
CYLIND. 1'X 6'												
FIVE CUBIC FT												
LONG RH-CANISTER	28	8.976E-01	0.43	1.08E+01	2.51E+01	4.80E+05	9.00E+04	0	0	0	28	0
SHORT RH-CANISTER												

TABLE 6 (cont.)

(6) HARD WASTE THAT WILL BECOME AVAILABLE FOR SHIPMENT

(1986-2015)

	(ACTIVITY)			NUMBER AT EACH Pu CURIE LEVEL										
	TOTAL Pu CURIES	TOTAL OF ALL ACTIVITY (CURIES)	TOTAL OF TRU-ALPHA CURIES	UP TO .6	.6 TO 2	2 TO 5	5 TO 10	10 TO 20	20 TO 80	80 TO 100	100 TO 1K	% LESS THAN 100 nci/gram	AVERAGE HEAT OUTPUT WATTS/M^3	FINES CONTENT YES/NO
CH-WASTE														
DRUMS														
GAL-30														
GAL-55	1.70E+06	2.00E+06	3.80E+05	7431	7500	7500	7500	7500	7500	2000	2000	0.0	3.00E-01	no
BOXES														
74.5"X50.5"X38.5"														
88"X54"X54"	2.50E+01	2.50E+01	1.00E+01	3	3	4	0	0	0	0	0	0.0	1.00E-03	no
112"X68"X77"														
68"X54"X38.5"	5.00E+03	1.75E+04	1.70E+04	150	150	150	150	150	200	50	0	0.0	3.00E-01	no
88"X48"X48"														
THREE METER CUBED														
NON-STANDARD BOX*														
BINS														
M III														
M-4														
120 CU FT BIN														
RH WASTE														
ONE GALLON														
FIVE GALLON														
THIRTY GAL														
FIFTY FIVE GAL														
CAN 12"X60"														
CYLIND. 1'X 6'														
FIVE CUBIC FT														
LONG RH-CANISTER	4.11OE+02	2.74E+03	5.80E+01	6	2	2	1	5	10	2	0	0.0	3.87E-02	no
SHORT RH-CANISTER														

TABLE 6 (cont.)

(G) HARD WASTE THAT WILL BECOME AVAILABLE FOR SHIPMENT

(1986-2015)

	NON-RAD HAZARDOUS MATERIAL	WEIGHT DIST. TOTAL WEIGHT Kgs	AVERAGE DENSITY Kgs/m^3	NUMBER AT EACH WEIGHT (Kgs) UP TO 180	180 TO 360	360 TO 680	680 TO 1360	1360 TO 2270	2270 TO 3180	3180 TO 5450	5450 TO 7700	7700 TO 11350	XXX XXXXXXX XXXXXXXXXX	ISOTOPIC CONTRIBUTION
CH-WASTE														
DRUMS														
GAL-30													Am241	15%
GAL-55	yes	1.00E+07	9.90E+02	19133	20000	10000	0	0	0	0	0	0	Pu238	10%
													Pu239,240	75%
BOXES														
74.5"X50.5"X38.5"														
88"X54"X54"	yes	3.00E+04	7.14E+02	0	0	0	0	0	10	0	0	0	Pu239,240	100%
112"X68"X77"													Am241	60%
68"X54"X38.5"	yes	2.00E+06	8.62E+02	0	0	0	300	300	400	0	0	0	Pu239,240	40%
88"X48"X48"														
THREE METER CUBED														
NON-STANDARD BOX*														
BINS														
M III														
H-8														
120 CU FT BIN														
RH WASTE														
ONE GALLON														
FIVE GALLON														
THIRTY GAL														
FIFTY FIVE GAL														
CAN 12"X60"														
CYLIND. 1'X 6'														
FIVE CUBIC FT													Pu53	25% Fissile Material Mass
LONG RH-CANISTER	yes*	7.32E+04	2.90E+03	0	0	0	4	2	22	0	0	0	U36	75%
SHORT RH-CANISTER													Pu53	15% Total Activity
													MFP/MAP	85%

* - 39% lead shot as shielding

TABLE 7

(7) SPECIAL CASE TRU WASTE THAT WILL BECOME AVAILABLE FOR SHIPMENT

(1986-2015)

	NUMBER OF CONTAINERS	VOLUME OF CONTAINER M^3	AVE. PACK. EFF. OF CONTAINERS	VOLUME OF WASTE METERS^3	VOLUME OF WASTE CONT. METERS^3	RAD LEVEL AT CONTACT: MAXIMUM RAD LEVEL mr/hr	RAD LEVEL AT CONTACT: AVERAGE RAD LEVEL mr/hr	NUMBER AT EACH LEVEL (mr/hr): UP TO 10	10 TO 100	100 TO 1K	1K TO 100K	100K TO 1000K
CH-WASTE												
DRUMS												
GAL-30												
GAL-55												
NONE FOR CH WASTE												
BOXES												
74.5"X50.5"X38.5"												
88"X54"X54"												
112"X68"X77"												
68"X54"X38.5"												
88"X48"X48"												
THREE METER CUBED												
NON-STANDARD BOX*												
BINS												
H III												
H-9												
120 CU FT BIN												
RH WASTE												
ONE GALLON												
FIVE GALLON												
THIRTY GAL												
FIFTY FIVE GAL												
CAN 12"X60"												
CYLIND. 1'X 6'												
FIVE CUBIC FT												
LONG RH-CANISTER	11	8.976E-01	0.48	4.70E+00	9.90E+00	1.00E+05	3.00E+04	0	0	0	11	0
SHORT RH-CANISTER												

TABLE 7 (cont.)

7) SPECIAL CASE TRU WASTE THAT WILL BECOME AVAILABLE FOR SHIPMENT

1986-2015)

	(ACTIVITY)			NUMBER AT EACH Pu CURIE LEVEL										
	TOTAL Pu CURIES	TOTAL OF ALL ACTIVITY (CURIES)	TOTAL OF TRU-ALPHA CURIES	UP TO .6	.6 TO 2	2 TO 5	5 TO 10	10 TO 20	20 TO 84	84 TO 100	100 TO 1K	% LESS THAN 100 nci/gram	AVERAGE HEAT OUTPUT WATTS/M^3	FINES CONTENT YES/NO
H-WASTE														
DRUMS														
GAL-30														
GAL-55				NONE FOR CH WASTE										
BOXES														
74.5"X50.5"X38.5"														
88"X54"X54"														
112"X68"X77"														
68"X54"X38.5"														
88"X48"X48"														
THREE METER CUBED														
NON-STANDARD BOX*														
BINS														
H III														
H-4														
120 CU FT BIN														
RH WASTE														
ONE GALLON														
FIVE GALLON														
THIRTY GAL														
FIFTY FIVE GAL														
CAN 12"X60"														
CYLIND. 1'X 6'														
FIVE CUBIC FT														
LONG RH-CANISTER	1.82E+02	1.891E+03	2.70E+01	1	4	1	0	1	4	0	0	0.0	4.79E-02	no
SHORT RH-CANISTER														

TABLE 7 (cont.)

(7) SPECIAL CASE TRU WASTE THAT WILL BECOME AVAILABLE FOR SHIPMENT

26

(1986-2015)

	NON-RAD HAZARDOUS MATERIAL	TOTAL WEIGHT Kgs	AVERAGE DENSITY Kgs/m^3	WEIGHT DIST. UP TO 180	180 TO 360	360 TO 680	680 TO 1360	NUMBER AT EACH WEIGHT (Kgs) 1360 TO 2270	2270 TO 3180	3180 TO 5450	5450 TO 7700	7700 TO 11350	SS MATERIAL DESIGNATION		
CH-WASTE															
DRUMS															
GAL-30								NONE FOR CH WASTE							
GAL-55															
BOXES															
74.5"X50.5"X38.5"															
88"X54"X54"															
112"X68"X77"															
68"X54"X38.5"															
88"X48"X48"															
THREE METER CUBED															
NON-STANDARD BOX*															
BINS															
M III															
M-4															
120 CU FT BIN															
RH WASTE															
ONE GALLON															
FIVE GALLON															
THIRTY GAL.															
FIFTY FIVE GAL															
CAN 12"X60"															
CYLIND. 1'X 6'															
FIVE CUBIC FT															
LONG RH-CANISTER	yes*	3.26E+04	3.30E+03	0	0	0	0	0	11	0	0	0	Pu53	25%	Fissile Material Mass
SHORT RH-CANISTER													U36	75%	
													Pu53	10%	Total Activity
													MFP/MAP	90%	

* - Lead shot used as shielding

TABLE

SPECIAL CASE TRU WASTE

A) STORED AND NEWLY GENERATED WASTE TO BE LEFT ON SITE

WASTE DEEMED NOT TO BE CERTIFIABLE THROUGH THE YEAR 2015

	NUMBER OF CONTAINERS	VOLUME OF CONTAINER M^3	AVE. PACK. EFF. OF CONTAINERS	VOLUME OF WASTE METERS^3	VOLUME OF WASTE CONT. METERS^3	RAD LEVEL AT CONTACT (ACTIVITY) MAXIMUM RAD LEVEL mr/hr	AVERAGE RAD LEVEL mr/hr	TOTAL Pu CURIES	TOTAL OF ALL ACTIVITY (CURIES)	TOTAL OF TRU-ALPHA CURIES	WEIGHT DIST. TOTAL WEIGHT Kgs
H-WASTE											
DRUMS											
55 GAL-30											
55 GAL-55											
BOXES											
74.5"X50.5"X30.5"											
[illegible]"X54"											
112"X68"X77"											
60"X54"X38.5"											
88"X48"X48"											
THREE METER CUBED NON-STANDARD BOX*	7	1.036E+02	1.0	1.036E+02	1.036E+02	2.00E+02	5.00E+00	1.50E+02	1.50E+02	1.30E+02	1.52E+04
BINS											
H III											
H-4											
120 CU FT BIN											
6ft Sphere	4	3.20E+00	1.0	1.28E+01	1.28E+01	0.00E+00	0.00E+00	1.54E+01	1.54E+01	1.54E+01	3.20E+04
RH-WASTE											
ONE GALLON											
FIVE GALLON											
2' dia x 15' long cask	12	1.30E+00	0.26	4.06E+00	1.56E+01	5.20E+05	9.90E+04	8.31E+02	2.28E+03	7.10E+01	3.93E+04
2.5'dia x 15' long cask	1	2.10E+00	1.0	2.10E+00	2.10E+00	1.75E+03	1.75E+03	1.89E+02	2.19E+02	1.70E+01	7.26E+03

TABLE 8 (cont.)
SPECIAL CASE TRU WASTE
(A) STORED AND NEWLY GENERATED WASTE TO BE LEFT ON SITE
WASTE DEEMED NOT TO BE CERTIFIABLE THROUGH THE YEAR 2015

| | AVERAGE DENSITY Kg/m^3 | AVERAGE HEAT OUTPUT WATTS/M^3 | FINES CONTENT (YES/NO) | NON-RAD HAZARDOUS MATERIAL | XXX XXXX

TABLE 9
SPECIAL CASE TRU WASTE
(9) SOIL CONTAMINATED WITH TRU NUCLIDES

	VOLUME OF WASTE METERS^3	RAD LEVEL AT CONTACT (ACTIVITY) MAXIMUM RAD LEVEL mr/hr	AVERAGE RAD LEVEL mr/hr	TOTAL Pu CURIES	TOTAL OF ALL ACTIVITY (CURIES)	TOTAL OF TRU-ALPHA CURIES	WEIGHT DIST. TOTAL WEIGHT Kgs	AVERAGE DENSITY Kgs/m^3	AVERAGE HEAT OUTPUT WATTS/M^3	FINES CONTENT (YES/NO)	NON-RAD HAZARDOUS MATERIAL
CH-WASTE											
RH-WASTE	1.140E+03	NA	NA	NA	NA	NA	3.00E+06	1.20E+03	NA	Yes	NA

TABLE 9 (cont.)
SPECIAL CASE TRU WASTE
(9) SOIL CONTAMINATED WITH TRU NUCLIDES

	SS MATERIAL DESIGNATION
CH-WASTE	
RH-WASTE	NA

TABLE 10
SPECIAL CASE TRU WASTE
(10) BURIED TRU WASTE

	NUMBER OF CONTAINERS	VOLUME OF CONTAINER M^3	AVE. PACK. EFF. OF CONTAINERS	VOLUME OF WASTE METERS^3	VOLUME OF WASTE CONT. METERS^3	RAD LEVEL AT CONTACT (ACTIVITY) MAXIMUM RAD LEVEL mr/hr	AVERAGE RAD LEVEL mr/hr	TOTAL Pu CURIES	TOTAL OF ALL ACTIVITY (CURIES)	TOTAL OF TRU-ALPHA CURIES	WEIGHT DIST. TOTAL WEIGHT Kgs
CH-WASTE											
DRUMS											
GAL-30											
GAL-55											
NOT CONTAINED	NA	NA	NA	1.00E+04	NA	NA	NA	4.50E+03	NA	6.35E+03	NA
BOXES											
74.5"X50.5"X38.5"											
80"X54"X54"											
112"X68"X77"											
68"X54"X38.5"											
88"X48"X48"											
THREE METER CUBED											
NON-STANDARD BOX*											
BINS											
H III											
H-4											
120 CU FT BIN											
RH-WASTE											
ONE GALLON											
FIVE GALLON											
THIRTY GAL											
FIFTY FIVE GAL											
CAN 12"X60"											
CYLIND. 1'X 6'											
FIVE CUBIC FT											
LONG RH-CANISTER											
SHORT RH-CANISTER											

none

TABLE 10 (cont.)

SPECIAL CASE TRU WASTE
(10) BURIED TRU WASTE

	AVERAGE DENSITY Kgs/m^3	AVERAGE HEAT OUTPUT WATTS/M^3	FINES CONTENT (YES/NO)	NON-RAD HAZARDOUS MATERIAL	XXX XXXXXXXX XXXXXXXXXXX ISOTOPIC DESIGNATION	CONTRIBUTION
CH-WASTE						
DRUMS						
GAL-30						
GAL-55						
NOT CONTAINED	NA	NA	Yes	Yes	Am241	56%
					Pu239,240	44%
BOXES						
74.5"X50.5"X38.5"						
88"X54"X54"						
112"X68"X77"						
68"X54"X38.5"						
80"X48"X48"						
THREE METER CUBED						
NON-STANDARD BOX*						
DIMS						
H III						
H-4						
120 CU FT BIN						
RH-WASTE						
ONE GALLON						
FIVE GALLON						
THIRTY GAL						
FIFTY FIVE GAL						
CAN 12"X60"						
CYLIND. 1'X 6'						
FIVE CUBIC FT						
LONG RH-CANISTER						
SHORT RH-CANISTER						

none

TABLE 11
(11) STORED WASTE TO BE HANDLED AS LOW LEVEL

	NUMBER OF CONTAINERS	VOLUME OF CONTAINER M^3	AVE. PACK. EFF. OF CONTAINERS	VOLUME OF WASTE METERS^3	VOLUME OF WASTE CONT. METERS^3	RAD LEVEL AT CONTACT (ACTIVITY) MAXIMUM RAD LEVEL mr/hr	AVERAGE RAD LEVEL mr/hr	TOTAL Pu CURIES	TOTAL OF ALL ACTIVITY (CURIES)	TOTAL OF TRU-ALPHA CURIES	WEIGHT DIST. TOTAL WEIGHT Kgs
CH-WASTE											
DRUMS											
GAL-30 GAL-55	650	2.082E-01	1.0	1.35E+02	1.35E+02	NA	NA	NA	NA	NA	8.00E+04
NOT CONTAINED											
BOXES											
74.5"X50.5"X38.5" 80"X54"X54" 112"X68"X77" 68"X54"X38.5" 80"X40"X40" THREE METER CUBED NON-STANDARD BOX*	1	1.75E+02	1.0	1.75E+02	1.75E+02	NA	NA	NA	NA	NA	2.50E+04
BINS											
H III H-4 120 CU FT BIN											
RH-WASTE											
ONE GALLON FIVE GALLON THIRTY GAL FIFTY FIVE GAL CAN 12"X60" CYLIND. 1'X 6' FIVE CUBIC FT LONG RH-CANISTER SHORT RH-CANISTER	none										

TABLE 11 (cont.)

(11) STORED WASTE TO BE MANAGED AS LLW LEVEL

	AVERAGE DENSITY Kgs/m^3	AVERAGE HEAT OUTPUT WATTS/M^3	FINES CONTENT (YES/NO)	NON-RAD HAZARDOUS MATERIAL	SS MATERIAL DESIGNATION	PROPOSED DISPOSAL LOCATION
CI-WASTE						
DRUMS						
GAL-30 GAL-55	5.92E+02	NA	no	no	Pu239,240-100%	Los Alamos LLW Burial Site
NOT CONTAINED						
BOXES						
74.5"X50.5"X38.5" 88"X54"X54" 112"X68"X77" 68"X54"X38.5" 88"X48"X48" THREE METER CUBED, NON-STANDARD BOX*	1.43E+02	NA	yes	no	Pu239,240-100%	Los Alamos LLW Burial Site
BINS						
II III II-4 120 CU FT BIN						
RH-WASTE						
ONE GALLON FIVE GALLON THIRTY GAL FIFTY FIVE GAL CAN 12"X60" CYLIND. 1'X 6' FIVE CUBIC FT LONG RH-CANISTER SHORT RH-CANISTER			none			

2.2 Discussion of CH Data Tables

2.2.1 Stored Waste Expected to be Certifiable Without Processing

The following CH-TRU waste were considered to be in this category of potentially certifiable without processing:

- All 30- and 55-gal. drums of combustible wastes (codes A-14, 15, 16, 17, 18, 19, 35, 40, 60)
- All 30- and 55-gal. drums of metal wastes (codes A-30, 31, 50, 51, 52)
- Slag and porcelain crucibles (code A-47)
- Glass (code A-95)
- Other noncombustibles in 30- and 55-gal. drums (codes A-41, 61)
- Chemical treatment sludge (code A-75)
- Cement paste (code A-76)
- Sources (code A-80)
- All high activity plutonium-238 and uranium-233 waste in concrete casks
- Wastes previously processed through the SRF

It should be noted that while all combustible wastes have been included, Los Alamos does intend to process - incinerate - up to about 65% of the combustible waste fraction. This treatment will result in substantial volume reduction and consequent overall cost savings.

The percentage of waste listed as "less than 100 nCi/g" is only a rough estimate as there is no practical means of otherwise determining this value solely from the currently available records. This statement applies also to the subsequent tables.

The Los Alamos TRU wastes contain varying mixtures of essentially all weapons grade and heat source plutonium isotopes/mixtures. In all of the tables, the former mixtures are identified simply as plutonium-239, 240, and the latter as plutonium-238, as no further detailed breakdown is practical.

The 11 listed boxes originated from early trial operations of the SRF. Several of these contain lead shielding that was an inseparable component of some glove boxes that were sectioned.

2.2.2 Stored Waste Not Expected to be Certifiable Without Processing.

The following CH-TRU wastes were considered to be in this category:

- Graphite (code A-10) - possible particulate
- Oil (codes A-20, 21) - possible free liquids
- Process wastes (codes A-25, 26, 27, 28, 29 56) possible particulate and free liquids
- All oversize, overweight wastes packaged in wooden crates and other non-standard containers

(codes A-19, 30, 31, 32, 33, 35, 36, 52, 55, 61) - size, weight, packaging acceptability

- HEPA filters (code A-55) - possible particulate
- Chemical waste (code A-70) - possible particulate and free liquids
- Vermiculite (code A-77) - possible particulate
- Soil (codes A-85, 90) - possible particulate
- Unknowns (code A-99) - unknown contents
- Corrugated metal pipes (code A-76) - size and weight

For the cases of non-standard size boxes and drums, the table shows the total number of containers that make up the total volume of these packages. A listing of all 397 non-standard crates in storage is provided in Appendix C. Included in this listing of all crates are seven with waste that we believe cannot reasonably be size reduced (see 2.2.8). A currently unknown number of these crates contain lead-lined glove boxes which, when sectioned, will result in lead-containing TRU waste.

Some specific data items for the non-standard drums and CMPs are not available at this time. These data items were not or could not be determined when the original waste was generated/packaged.

A total of 7 drums of Los Alamos stored waste are listed as containing "chemical waste". In most instances this waste is a solvent material absorbed on vermiculite.

2.2.3 Newly Generated Waste Expected to be Certifiable Without Processing

The large majority of Los Alamos TRU wastes generated in 1986 and beyond will be certifiable, and by early FY 87, all such wastes are expected to be certified. Included in this listing are an estimated 12 992 drums (2705 m^3) of combustible wastes that will be incinerated. This waste is included in this table, however, because the incineration is not a required processing for WIPP disposal. The incineration of this waste will be accomplished solely for reasons of cost effectiveness. Incineration will result in approximately 284 drums (59 m^3) of waste actually going to WIPP. Estimates of radiation and contamination characteristics are based upon extrapolations of 1985 waste data. A change in the Los Alamos TRU waste stream anticipated during 1986 will be the inclusion of drums of immobilized americium-241. Contamination levels of up to 1000 alpha curies per drum are expected, with the total americium-241 content per year estimated at 5 kg.

2.2.4 Newly Generated Waste Not Expected to be Certifiable Without Processing

Drums containing wastes not certifiable without processing are expected to continue to be generated only during 1986. These wastes will be primarily the process wastes, codes A-25 through A-29 (see 2.2.2).

Non-standard boxes are the glove boxes and other bulky metallic wastes to be generated that will require size reduction treatment for ultimate disposal at WIPP. Hazardous material contained in a portion of this waste is lead shielding built into some glove boxes; this lead is inseparable from the TRU waste.

2.2.5 Soft Waste That Will Become Available for Shipment

Soft wastes to be shipped to the WIPP are only those combustible solids that are not able to be incinerated due to their higher levels of TRU contamination. All soft wastes are expected to be packaged in 210 L (55 gal.) drums.

2.2.6 Hard Waste That Will Become Available for Shipment

Hard wastes to be shipped to the WIPP include the following forms:

- Cemented solids
- Miscellaneous noncombustible solids, glass, etc
- Chemical treatment sludge
- Metals

Two waste streams - larger metal wastes originating primarily from operations in the SRF, and the cut up sections of the CMPs - are the major streams to be packaged in boxes. Current planning is to utilize the "TRUPACT efficient" size box -1.73 x 1.37 x 0.98 m (5.67 x 4.50 x 3.21 ft), although it is recognized that as TRUPACT is modified, this box size also may change. All of the remaining hard waste streams will be packaged in 210 L (55-gal.) drums for WIPP disposal.

Please note that in both this and the previous table, the breakdowns of numbers of packages by "Pu curie" and dose level are, at best, very rough approximations.

Non-radioactive hazardous material, contained in a portion (currently unknown) of the boxed waste originating from the SRF, is lead shielding built into some glove boxes. This lead is inseparable from the TRU waste.

2.2.7 Special Case Wastes That Will Become Available for Shipment

Based upon the definition of special case (SC) waste currently being applied at Los Alamos, no CH-TRU SC wastes are anticipated as being certified. Wastes are SC because there is no identified, practical means of processing for WIPP acceptance.

2.2.8 Stored and Newly Generated Waste to be Left On Site-Waste Deemed Not to be Certifiable Through the Year 2015

Currently only a small volume - 116 m^3 (4096 ft^3) total - of the stored Los Alamos waste is identified as not being able to be processed satisfactory for WIPP acceptance. This waste includes seven oversized boxes containing large equipment items not able to be size reduced, and four 1.8 m (6 ft) diameter experimental spheres.

2.2.9 Soil Contaminated With TRU Nuclides

An estimate of the total volume of contaminated TRU soil is 1140 m^3 (40 253 ft^3). No other data, however, is available for much of this material. The soil originates from being contaminated in association with previously buried TRU wastes, both CH and RH, and from some previous disposal of TRU liquids into the ground. The respective volume estimates are 1000 m^3 (35 310 ft^3) and 140 m^3 (4943 ft^3). As both CH- and RH-TRU wastes have been buried, it is expected that some co-contaminated soil also is CH and RH. It is not possible, however, to estimate these fractions.

2.2.10 Buried TRU Wastes

Based upon the 100 nCi/g definition of TRU waste, it is estimated that 10 000 m^3 (353 100 ft^3) of this

waste has been buried at Los Alamos. Based upon our method of estimating this value, however, we consider this a maximum possible volume. This value includes both CH and RH-TRU wastes.

Portions of this volume were uncontained, for example, cement paste solidified in augered shafts. Other wastes originating from liquid waste treatment - sludge and cement - originally were packaged in drums. Solid wastes originating from TRU work and processing areas may have been uncontained, or contained in plastic bags and/or cardboard boxes, drums, or wooden boxes. Remote handled TRU wastes typically would have been packaged originally in small paint-type cans which may have been contained in a plastic overpack and/or plastic bag.

2.2.11 Stored Waste to be Managed as Low-Level

The original draft IWOP estimated 500 m^3 (17 655 ft^3) of Los Alamos stored CH-TRU waste through 1982 to be non-TRU based upon the new 100 nCi/g definition. Since then, no new waste in the 10 to 100 nCi/g range has been added to storage. During 1984, 190 m^3 (6709 ft^3) of stored waste below the 100 nCi/g level was retrieved and has been buried. Consequently, we currently estimate that only 310 m^3 (10 946 ft^3) (approximately 4.4%) of the currently stored waste will

eventually be found to be non-TRU based upon the new definition. This very low estimated fraction of non-TRU waste for Los Alamos originates almost entirely due to the TRU definition change. Los Alamos historically has had "state-of-the-art" assay instrumentation in operation that was capable of segregating TRU from non-TRU, even at the lower 10 nCi/g level. In Table 11, just as the total volume of non-TRU waste is an estimate, so are the estimates of the breakdown of this waste according to its packaging in drums and boxes.

2.3 Discussion of RH Data Tables

Tables 1 through 8 also contain some data specific to Los Alamos RH-TRU wastes.

2.3.1 Stored Waste Expected to be Certifiable Without Processing

Since about 1984, RH-TRU wastes at Los Alamos have been prepared, packaged, and stored in a manner that is fully compatible with certification and packaging in the WIPP RH-TRU canister. The basic waste container is described in Appendix B. Data on the "isotopic contribution" of this waste are presented according to (1) percent by weight of fissile material, and (2) percent by total activity.

2.3.2 Stored Waste Not Expected to be Certifiable Without Processing

No RH waste is expected to require processing for certification beyond that accomplished by the generator in preparing the waste for disposal.

2.3.3 Newly Generated Waste Expected to be Certifiable Without Processing

Per current plans (see 4.3), future generations of RH-TRU waste originating from the close-out of RH-TRU operations at Los Alamos will be packaged directly into RH canisters.

2.3.4 Newly Generated Waste Not Expected to be Certifiable Without Processing

No RH waste is expected to require processing for certification beyond that accomplished by the generator in preparing the waste for disposal.

2.3.5 Soft/Hard Waste That Will Become Available for Shipment

While a portion of Los Alamos RH TRU waste is "soft" waste, it is not practical to segregate from "hard" wastes. All RH-waste to be sent to WIPP, therefore, is listed as "hard" waste in Table 6. At least some of these canisters will contain lead used for shielding.

2.3.6 Special Case TRU Waste That Will Become Available for Shipment

Currently it is believed that 11 existing steel/concrete casks (see Appendix B) in storage that contain RH TRU waste can be certified by NDA-NDE means and overpacked in the long RH canister. However, because this supposition is somewhat speculative, these wastes are listed as being SC. These 11 canisters are included in the data of Table 6. All of these casks contain lead used for shielding.

2.3.7 Stored and Newly Generated Waste to be Left On Site

Currently in storage are a total of 13 steel/concrete casks (see Appendix B) for which there appears to be no practical means to certify. These casks exceed the size of the RH canister. In each case, the actual RH waste is encased in concrete within the cask, thus making retrieval and repackaging extremely difficult. Twelve of these casks contain lead used for shielding, and the other one likely contains some small quantity of metallic sodium, a pyrophoric material. Currently, it is anticipated that all NG RH-TRU waste will be certified and disposed of at the WIPP; no NG waste will be left on site.

2.4 TRU Content of Waste

2.4.1 Stored CH Waste Through 1985 (Tables 1 and 2)

Contact-handled waste in storage at Los Alamos through 1985 contained a total of 413.6 kg of TRU materials, having the following isotopic distribution:

plutonium-239, 240	:	95.9%
uranium-233	:	1.0%
plutonium-238	:	1.8%
plutonium-242	:	0.3%
americium-241	:	0.9%
other	:	0.1%

Plutonium-239, 240 refers to all of the mixtures of these isotopes (Pu-51 through Pu-57), while plutonium-238 is heat source material (Pu-83). Other isotopes treated as TRU include radium-226, neptunium-237, and curium-243, 244.

Other contaminants in the waste include the following:

mixed fission products	:	2.62	Ci
uranium-235	:	9419	g
uranium-238	:	539495.3	g
thorium-232	:	21000	g

2.4.2 Stored RH Waste Through 1985 (Tables 1 and 2)

Remote-handled waste in storage at Los Alamos through 1985 contained the following radionuclides as contaminants:

plutonium-239	:	1.73 kg
uranium-235	:	4521 g
mixed fission products	:	3988 Ci
uranium-238	:	5.3 g

2.4.3 Buried TRU Waste

The buried TRU waste is estimated to contain a total of 13.5 kg of transuranics. The distribution of this material is as follows:

uranium-233	:	20%
plutonium-238	:	0.01%
plutonium-239, 240	:	67%
americium-241	:	13%

2.4.4 Soil Contaminated With TRU Nuclides

For the estimated 1000 m^3 of TRU soil contaminated through the past burial of TRU wastes, it is not practical to approximate an associated quantity of TRU isotopes. The contamination associated with this soil, therefore, is included above in 2.4.3. The 140 m^3 of TRU soil contaminated by the disposal of TRU liquids is estimated to contain 0.12 kg (8.6 total Ci) of TRU

as plutonium-239, 240. As both CH- and RH-TRU wastes have been buried, it is expected that some co-contaminated soil also is CH and RH. It is not possible, however, to estimate these fractions.

3.0 Methods and Facilities Required for Certification of Wastes

3.1 General

Most contact-handled (CH)-transuranic (TRU) wastes stored at Los Alamos National Laboratory (Los Alamos) are resting on above- and below-ground asphalt pads at Technical Area (TA)-54 and are covered with plywood sheets, heavy vinyl sheeting, and a minimum of 1 m (3.3 ft) of earth overburden (Figure 3).

Figure 4 identifies and shows the locations of the several primary Laboratory TAs where Inventory Work-Off Plan (IWOP) activities will occur. As indicated in the previous section, TRU wastes are packaged primarily in drums and Fiberglas-reinforced-polyester (FRP)-coated plywood crates. The wastes consist of equipment such as decommissioned glove boxes, room and glove box trash (both combustible and noncombustible), plutonium-processing line wastes (including precipitates, salts and cakes), sludges, cemented wastes, high efficiency particulate air (HEPA) filters, contaminated soils, building decommissioning debris, absorbed oils, graphite, and seven drums and one crate of unknown content. Examinations of packages around access and inspection pits have shown that packages are in generally good condition.

Additionally, there are 158 0.8 m (30 in.)-diameter corrugated metal pipes (CMPs), 6.1 m (20 ft) long, filled with cemented TRU sludges and other cemented TRU liquids that are being stored in a pit at Area T at the TA-21 waste treatment plant. It is anticipated that these CMPs will be moved to TA-54

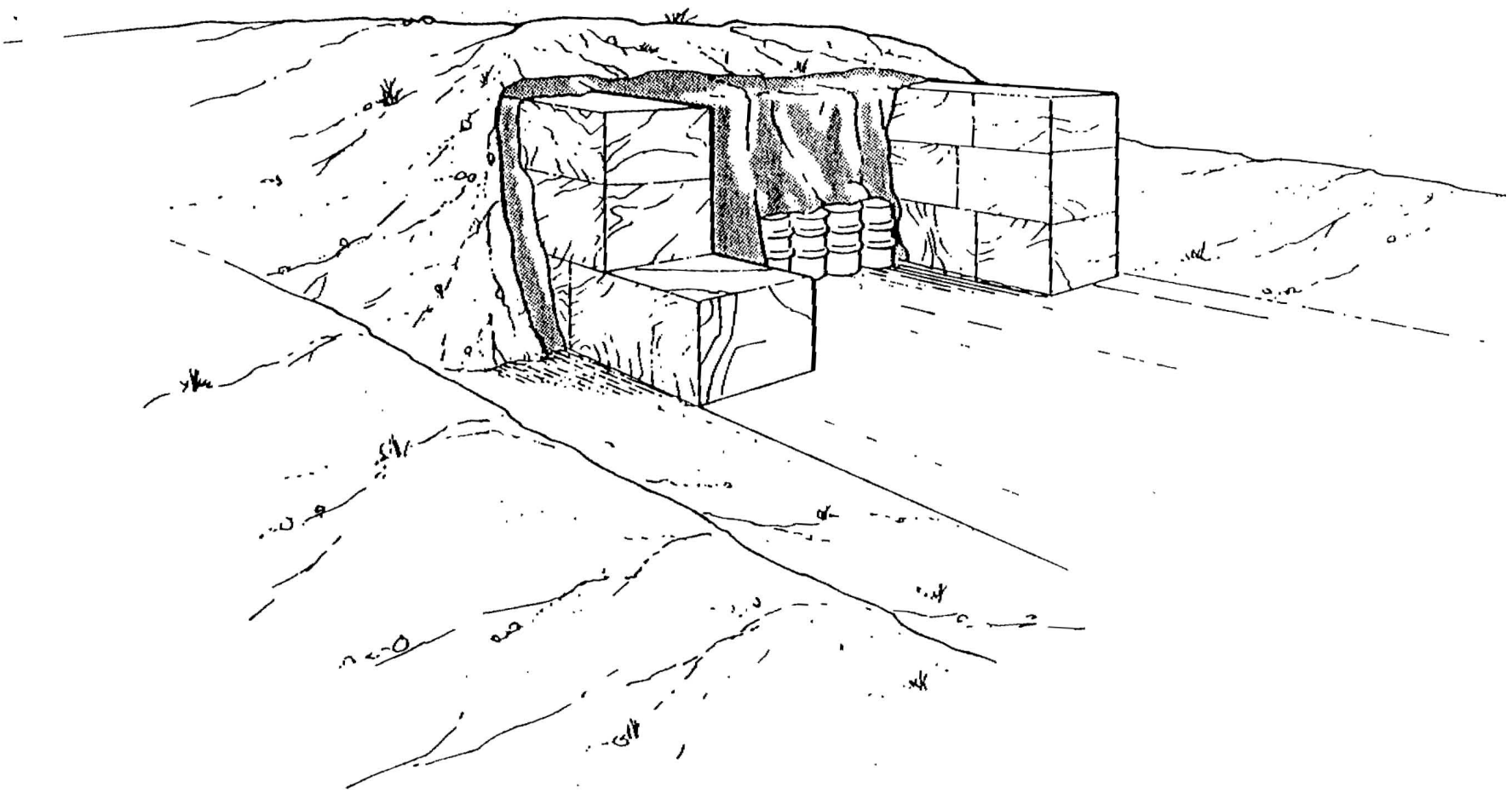
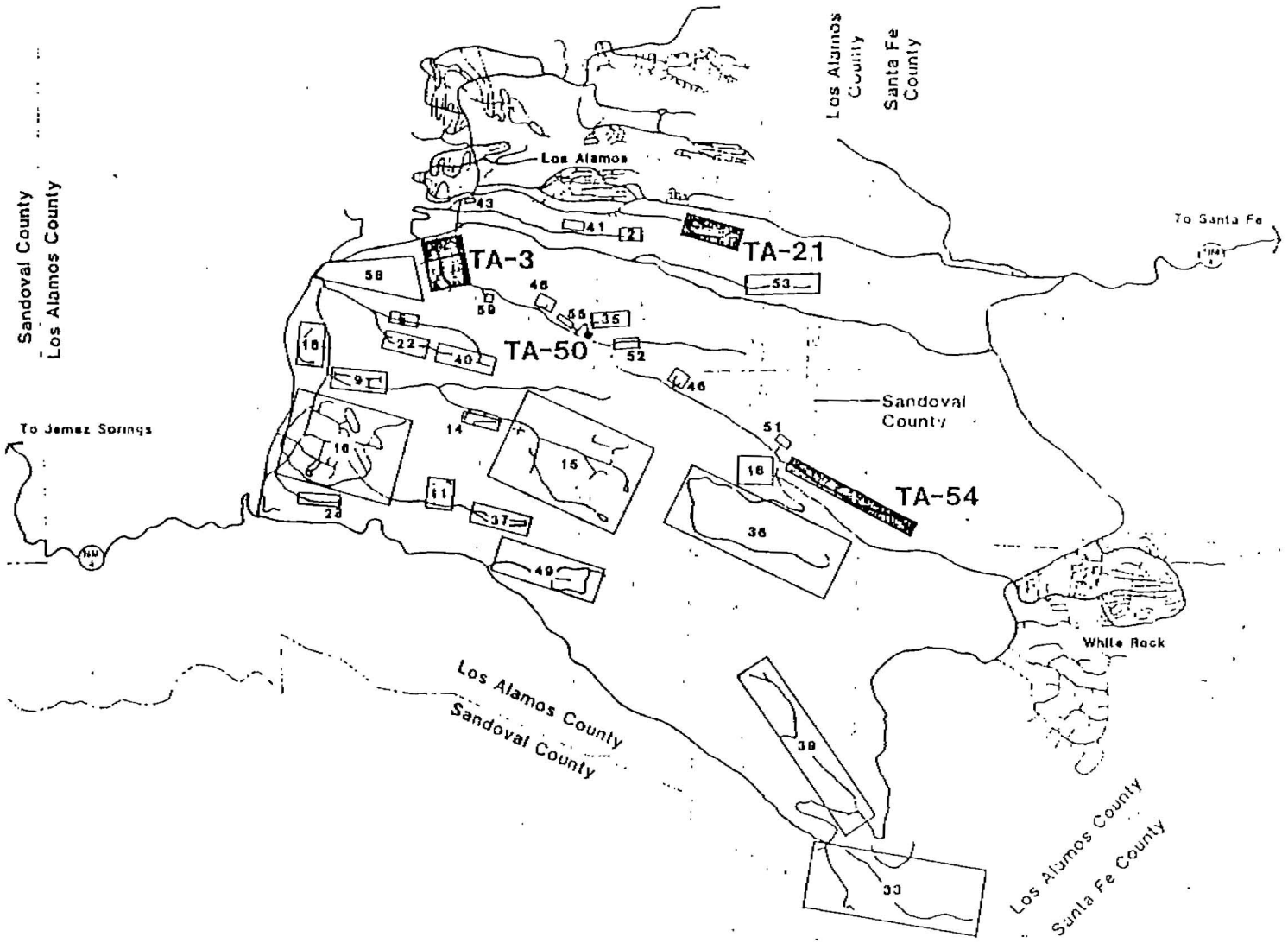


FIGURE 3. TRU Waste Storage Pad



TECHNICAL AREA
LOCATION MAP

North

0 6,000 12,000

Feet

FIGURE 4

TRU WASTE INVENTORY
WORK-OFF FACILITIES

Los Alamos National Labor
Los Alamos New Mexico 8

Lab Job No.: 7641-0 Date: 9-30

Holmes & Narver, Albuquerque, NM

H&N Job No.: 1844.70 H&N Task No: 136

by the end of fiscal year (FY) 86 for temporary holding and storage. Drums of high-activity plutonium-238 and uranium-233 waste are stored in concrete culverts at TA-54. Also at TA-54 are 24 steel/concrete casks of varying dimensions containing remote handled (RH)-TRU wastes. Each cask is stored in an individual shaft.

3.2 Retrieval

Retrieval will proceed at a rate consistent with the certification, nondestructive analysis and examination, and processing facilities through-puts so that the quantity of retrieved, noncertified wastes can be minimized. Through mid-FY 88, the only storage section to be retrieved will be that portion of the first above-ground storage pad that encloses only FRP-coated plywood crates containing decommissioned equipment. This phase of the retrieval effort is in conjunction with the operations scheduled for the Size Reduction Facility (SRF).

Retrieval work will require heavy earthmoving equipment (e.g., bulldozer, scraper) and a crane capable of about an 18.3 m (60 ft) reach to remove the overburden. A small rubber track front-end loader will also be required to assist in the final stages of this operation. Final excavation, the last 0.1 m (4 in.), will require manual labor to ensure that no packages are breached. Waste then will be removed using the crane for larger crates and a forklift for smaller crates and drums. Retrieval of crates containing waste for processing in the SRF was initiated during FY 84.

At the TA-21 storage site, the same equipment and approach will be used for retrieving the cement-filled CMPs. In FY 86, the CMPs will be retrieved from TA-21 and moved to temporary storage/holding at TA-54. Similar CMPs containing low-level waste were retrieved and transported to TA-54 for burial during FY 84. This operation revealed no difficulties in removing the overburden and no contamination or breaks in containment were encountered.

3.3 Nondestructive Analysis and Nondestructive Examination

Retrieved waste containers will be sorted and staged according to the computer data-base records. Some containers, such as those containing decommissioned equipment, may be sent directly to the Size Reduction Facility (SRF) after a physical check to ensure container integrity. Any breached container, or those with questionable integrity, will be overpacked for safe onsite handling.

Those retrieved containers for which certification is thought possible without further processing will be sent to the ~~TRU Nondestructive~~ Analysis - Nondestructive Examination (NDA-NDE) Facility beginning in FY 88 to verify the package contents by real-time x-ray radiography (RTR) and radioassay. Also, retrieved combustible wastes will go to the Treatment Development Facility (TDF) for incineration beginning this fiscal year. Combustible wastes identified in the NDA-NDE Facility will be sorted further in a glove box both to remove incompatible items

and to repackage the waste in a container acceptable to the controlled air incinerator (CAI).

As a result of nondestructive analysis and examination, further segregations will be made. Some containers may require package entry and more extensive waste component sorting for removal of undesireable items. This will be accomplished within the glove box lines in the TRU Waste Processing Facility beginning in FY 93. Containers of materials to be processed (soils, construction debris, filters, process line wastes, etc.) will be sent to the TRU Waste Processing Facility after which these and other directly certifiable wastes will be sent to certified retrievable storage or to the Transportation Facility. Overpacking for the Waste Isolation Pilot Project (WIPP) (6 drums in an overpack crate), where required, also can be accomplished either at the TRU Waste Preparation Facility or the TRU Waste Transportation Facility.

3.4 Processing Methods for Contact-Handled (CH) Waste

3.4.1 Decommissioned Equipment

Equipment such as decommissioned plutonium process line glove boxes, process line equipment, machine tools, and ductwork will be processed and packaged at the SRF. Process controls, computer data base records, and assay will be the basis for certification. The Los Alamos mobile assay and examination system will be utilized to assist in certifying these wastes. Several of the glove box units require

sectioning so that processing in the SRF can be accomplished. While the exact technique and location for this task are not yet determined, it is assumed that completion is possible based upon past operating experience.

3.4.2 Sludges

3.4.2.1 Corrugated Metal Pipes (CMPs).

Cemented TRU solutions will be processed in a saw facility (CMP Saw / Processing Facility), where each 6.1 m (20 ft) CMP will be cut into five approximately 1.2 m (4 ft) lengths. Sections will be packaged into Department of Transportation (DOT) 7A, TRUPACT-efficient metal boxes. A box will accommodate two sections, each of which is cradled in blocks to prevent shifting during shipment. The cemented solutions were analyzed radiochemically when they were placed into the CMP; therefore, the computer data base will be used for certification.

3.4.2.2 Drums of Dewatered Sludges

Dewatered sludges are packaged in 5 mil plastic bags contained in 90 mil polyethylene-lined 210 L (55 gal.) DOT 17C drums. The sludge consists of partially dewatered ferric hydroxide precipitate (30% to 40% solids). Approximately 9 kg (20 lbs) of dry Portland cement was added below and above the sludge to absorb any free water that might separate. Certification of

this waste will require verifying that free liquids are not present in the drums.

3.4.3 Combustibles

About 65% of the combustibles (room trash and other combustibles such as oils) are suitable for incineration at the TDF. The 65% originates from analyses of the TRU loading of stored and new wastes; only those wastes with a low TRU content can be incinerated due to inventory limitations at the TDF. Combustible wastes identified for incineration and containing tramp metals, cans, glassware or other noncombustible items will need to be sorted in a feed-preparation glove box line. All combustibles to be incinerated will require repackaging in the feed-preparation line to be compatible with the incinerator waste-charging operation. Three drums of graphite also will be transferred to the TDF and incinerated. The small volume of residual ash from incinerator operations will be immobilized in cement at the new waste management facility being constructed in the Los Alamos Plutonium Facility (TA-55).

Combustible wastes that cannot be incinerated due to their higher TRU loading (approximately 35% of total) will be certified directly, where possible, by NDA-NDE methods.

3.4.4 Noncombustibles

The noncombustible fraction of the glove box trash and other wastes will be segregated into two segments, those

that may produce airborne particulates and the non-particulate-producing materials.

3.4.4.1 Solids, Nonparticulate-Producing

Nonparticulate-producing wastes, where possible, will be certified directly by means of NDA-NDE techniques. Nonparticulate solids segregated in operations of the TRU Waste Processing Facility or TDF will be packaged and certified (as newly generated wastes) in these facilities.

3.4.4.2 Solids, Particulate Producing

Those materials that potentially would create airborne particulates will be immobilized by cement or another agent depending on the physical requirements. The primary alternative under consideration is that these items most likely will simply be added to drums along with cemented residues. This treatment will be accomplished in the TRU Waste Processing Facility beginning in FY 93.

3.4.4.2.1 Contaminated Soils.

About 134.7 m^3 (4755 ft^3) have been generated from decommissioned facilities and decontamination projects. The primary alternative being considered is cement fixation. This soil-concrete mixture will be a monolithic solid waste form. The mixer will feed its contents into a drum affixed to a bag-out port.

3.4.4.2.2 HEPA Filters

There currently are approximately 166 m^3 (5914 ft^3) of high efficiency particulate air (HEPA) filters, wrapped in plastic bags and sealed in boxes or drums. The wrapped filters can be introduced into a glove box in the processing facility where a proposed three stage shredder will shred the filter media and wood ~~frames~~. This glove box will be connected with the mixer glove box so that the shredder media also can be immobilized. The shredder media and an immobilization agent such as Envirostone can be added simultaneously to a drum attached to the ~~mixer glove~~ box bag-out port. If feasible, the fixation media will be an existing waste stream in order to minimize total waste volumes.

The overall HEPA filter volume will be reduced about 5:1 where the final volume includes the addition of the immobilization agent.

3.4.5 Mixed-Stream Wastes

The twenty-one drums of absorbed oil wastes will be x-rayed for free-oil inclusions. If free oil exists, it will be repacked with sorbent which will also fill any voids. The computer data base and assay will be used for certification. An alternative to be investigated will be direct incineration of this waste.

An additional seven drums of waste identified as having chemical characteristics will be certified/processed on a case-by-case basis. Incineration will be utilized where possible on this material.

3.4.6 Process Wastes

There are about 416 m^3 (14 682 ft^3) of process wastes from the Los Alamos Plutonium Facility (TA-55). They consist of evaporator bottoms, precipitates, sludges, filter cakes, leached solids, etc. Generally, the wastes are packed in small cans (similar to paint cans), which are, in turn, packed in drums. The materials are at the high end of nonrecoverable TRU wastes with up to 200 g plutonium-239 or up to approximately 20 g of americium-241 per drum. These will be the last wastes of the retrievable inventory to be processed. Cement fixation is the alternative being considered.

Examination, sorting, and processing operations will be carried out in glove boxes in the TRU Waste Processing Facility. Gamma shielding for operating personnel will be required due primarily to americium-241. A can-by-can examination will be required with treatment dependent on factors such as pH, physical form, and chemical content. Final treatment will probably consist of solidification and immobilization with such agents as Portland cement (pH greater than 7) or Envirostone (pH 3 to 7), with

neutralization required for very-low-pH wastes. A funding need in FY 88 has been identified to further research and develop the specific appropriate techniques for solidifying the variety of process wastes known to exist.

3.4.7 Unknown Wastes

Seven drums and one FRP-coated crate of wastes are listed in the computer data base as "unknown". These containers will be examined by RTR and radioassay in the NDA-NDE Facility. If possible, the contents will be identified and a category will be assigned for subsequent processing and certification. Container opening and waste segregation, if necessary, into certifiable or treatable categories would be carried out in the TRU Waste Processing Facility glove box line.

3.4.8 Special Case (SC)

There are some small volumes of waste that cannot reasonably meet the criteria for certification. One option, the most realistic identified to date is greater confinement disposal (GCD) burial at the Los Alamos TA-54 Disposal Site. Wastes currently identified as CH-SC include massive metallic objects and machine tools that cannot be processed in the SRF. The currently identified volume of these wastes is 116 m^3 (4095 ft^3). The exact magnitude of the problem and possible solutions for these wastes will be addressed following the work-off effort (FY 97) on a case-by-case basis.

3.5 Remote-Handled Wastes

The inventory through 1985 of RH-wastes consisted of 23 steel/concrete casks 0.6 m (2 ft) in diameter and up to 4.4 m (14 1/2 ft) long, one cask 0.8 m (32 in.) in diameter by 4 m (13 ft) long, and 5 pipes 0.3 m (9.5 in.) in diameter by 2.5 m (100 in.) long.

The single cask above contains the core of the Los Alamos Molten Plutonium Reactor Experiment. This unit is encased in concrete inside a 6 mm (1/4 in.) thick steel casing. This cask cannot reasonably be opened, and consequently presents a SC waste.

Twelve of the other casks also present SC waste handling problems. Each consists of small cans of waste sealed in a 13 mm (1/2 in.) wall, 0.2 m (9 in.) diameter steel pipe, surrounded by concrete within a 0.6 m (24 in.) diameter, 6 mm (1/4 in.) wall steel pipe. These casks are too long to be overpacked and fit into the RH waste transport cask. Options for disposal of these casks include the following:

- o burying the casks on-site permanently,
- o making special shipping arrangements for terminal storage at the WIPP, or
- o opening the casks and repacking the contents.

The first option would require an environmental impact study before on-site burial could be considered. The second option depends on the final WIPP SC acceptance criteria, and the third

option would require the construction of a remote handling facility, which, for the few casks involved, would probably be economically infeasible.

The remaining eleven casks are of a size that, we believe, can be over-packed for shipment. Certification of these wastes is thought possible by means of NDA-NDE technology currently being developed at Los Alamos. The proposed schedule for this effort is discussed in Sections 4.3 and 4.4.

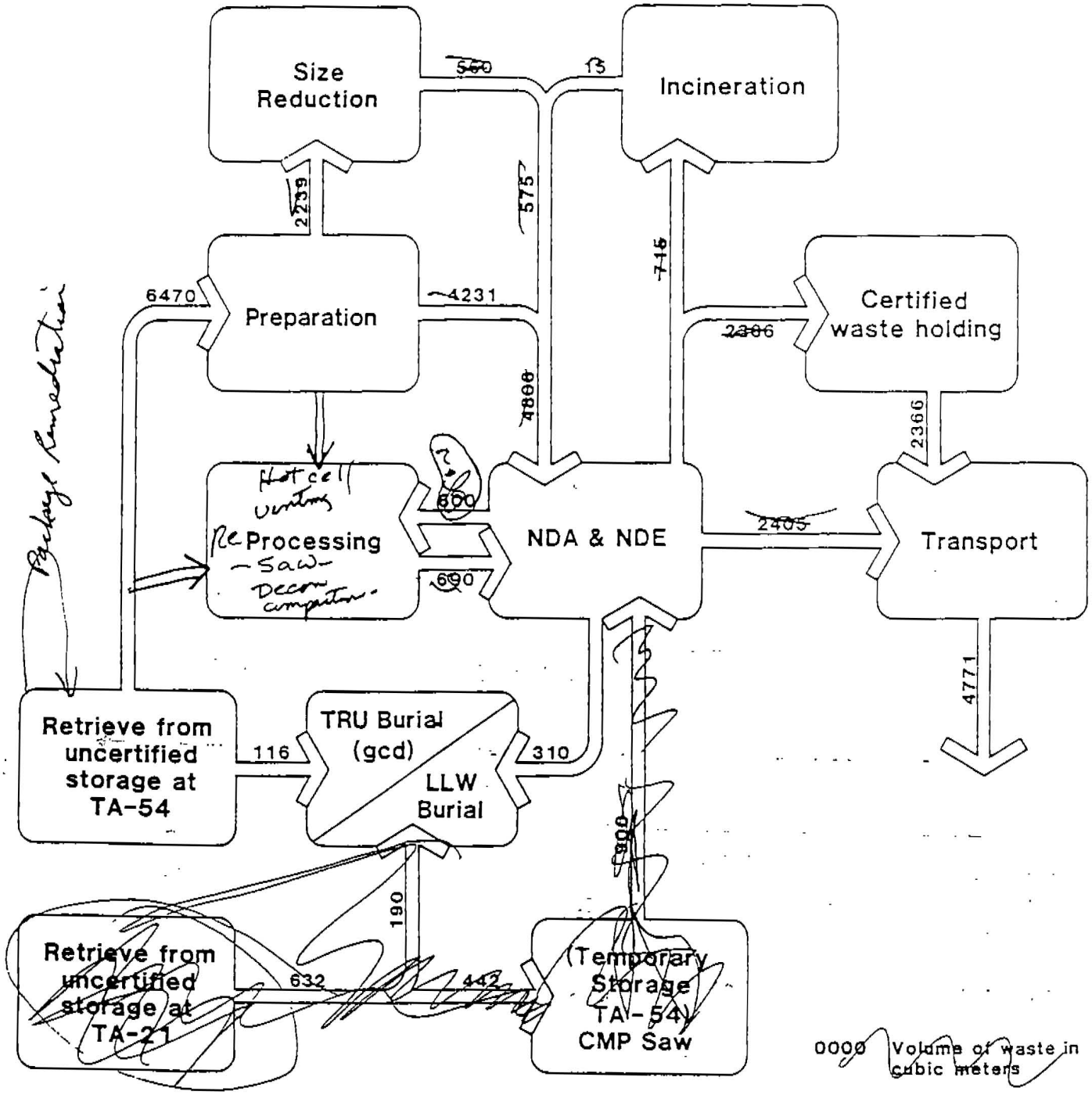
3.6. Facilities

Containers of wastes removed from the TRU retrievable storage areas will move through a series of inspections and assays, sorting and treatment facilities necessary for certification, and finally, to the TRU Waste Transportation Facility. This is illustrated in a flow sheet form in Figures 5 and 6.

3.6.1 Size-Reduction Facility (SRF)

The SRF, also designated as TA-50, building Waste Management (WM)-69, was designed and constructed so that methods could be developed to reduce volume and repackage various types of metallic waste items contaminated with TRU levels greater than 100 nCi/g of material. The SRF is currently being modified to accept the higher inventories associated with the work-off of TRU wastes.

The materials-handling equipment and plasma-arc cutting torch are parts of a production-oriented prototype process



PROCESS PATH FOR TRU WASTE STORED ~~THRU CY 85~~

TRU WASTE INVENTORY WORK-OFF FACILITIES

FIGURE 5

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

Lab Job No.: 7641-0 Date: 6-15-86

Holmes & Narver, Albuquerque, NM

H&N Job No.: 16447.0 H&N Task No: 136

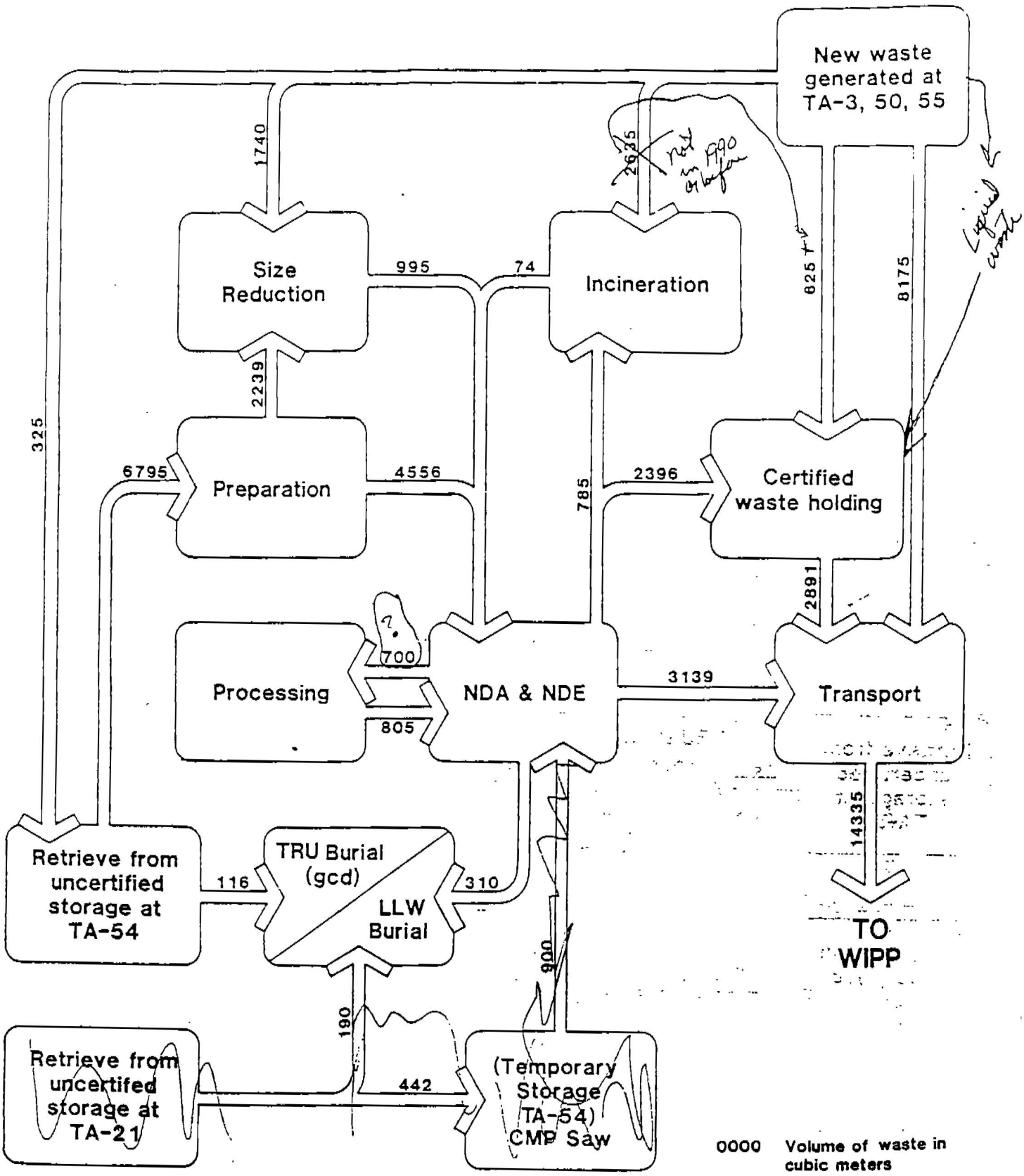


FIGURE 6

PROCESS PATH FOR NEWLY GENERATED AND TRU WASTE STORED DURING WORK-OFF PERIOD CY 86 TO CY 15

64

TRU WASTE INVENTORY WORK-OFF FACILITIES

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

Lab Job No.: 7641-0 Date: 6-15-85

Holmes & Narver, Albuquerque, NM

H&N Job No.: 1644.70 H&N Task No: 136

being developed to reduce the volume of glove boxes, mechanical equipment, and other metallic objects primarily resulting from the decommissioning of the old Los Alamos Plutonium Facility at TA-21.

In the SRF, the retrieved waste equipment is uncrated and introduced into the process enclosure. A bridge crane, a turntable, and an electromechanical manipulator position the waste to be cut by the plasma-arc cutting tool. The cut pieces then are moved to the bag-out port, and there packaged into a Department of Transportation (DOT) 7A approved TRUPACT-efficient box.

3.6.2 Treatment Development Facility (TDF)

The TDF, building WM-37, was designed and constructed for development of incineration methods to reduce volume, stabilize chemical composition and eliminate combustibility of defense TRU wastes. The CAI in the TDF successfully completed the TRU demonstration program and has been subsequently modified to process other wastes. These include beta-gamma radioactive waste, ion exchange resins, carcinogens, oils, and other hazardous chemical wastes in both solid and liquid form. It is proposed that the CAI be used to incinerate both NG and retrieved TRU combustible wastes. Approximately 65% of TRU combustible wastes can now be incinerated based upon current TRU inventory restrictions within this facility. NG wastes currently are scheduled for

incineration beginning in FY 86; retrieved wastes will be incinerated beginning in FY 88. This would require about two two-week operating campaigns per year beginning in FY 86 with a third campaign added in FY 88. The existing CAI is currently undergoing modifications to facilitate production treatment of TRU waste. A new production-oriented incinerator system is being designed for more efficient processing of larger quantities of wastes and varying inventories associated with the work-off plans and other Laboratory needs. Funding for this unit is being provided from DOE production programs.

3.6.3 TRU Waste Preparation Facility

The TRU Waste Preparation Facility is an outgrowth of an initially proposed Retrieval Facility and a Decontamination Facility. It is intended primarily to provide dedicated space for three functionally related operations as follows:

- The removal of earth and bituminous corrosion protection coatings from 210 L (55 gal.) steel waste storage drums and, as required, soil from FRP-coated plywood storage crates.
- The evaluation of the structural integrity of waste packages and the repair or overpacking of structurally deficient drums.

- The staging of waste packages for the next step in a series of waste handling procedures.

This facility is intended only for the cleaning, examination, and staging of containers used in packaging TRU waste materials. The initial phase of retrieval operations on stored wastes at TA-54 began in FY 85 and will proceed through mid-FY 88. During this period, only that portion of the storage pad containing FRP-coated plywood crates of decommissioned equipment will be retrieved. The FRP-coated crates are unaffected by short-term exposure to adverse weather conditions; thus, no environmental protection is required for the relatively short period between the time the FRP-coated crates are retrieved at TA-54 and processed in the SRF. The crates will undergo a visual inspection and a check for any accumulated water in the Waste Preparation Facility before being shipped to the SRF. Beginning in mid-FY 88, retrieved drums will be taken to the Waste Preparation Facility where they will undergo cleaning, inspection, and staging.

A modified tension-support structure 15.2 m (50 ft) wide by 33.5 m (110 ft) long will be erected adjacent to the masonry-constructed cleaning and inspection building. This tension-support structure is a polyester fabric stretched over 0.2 m (6 in.) aluminum "I" beams. The structure will provide an environmental shelter for the employees and

exposed waste packages, and it will provide some confinement if a package is accidentally breached.

As the drums are physically removed from the storage berms, they will be visually inspected to ensure their safe movement over the short distance to the TRU Waste Preparation Facility. Once at this facility, they undergo a more thorough visual and ultrasonic examination to ensure their safe handling within the facility or movement to the other TRU Waste Work-Off Facilities.

The retrieved drums will then undergo a high-pressure steam cleaning operation whereby the protective coating will be removed. The wash water containing the protective coating material (a paraffin-like material) will be drained to a 18 925 L (5000 gal.) storage tank. Even though it is highly unlikely, this collection system is potentially contaminatable, and is designed and treated as such.

After being cleaned, the drums will undergo an ultrasonic examination to verify their integrity prior to shipment to other TRU Waste Work-Off Facilities. This ultrasonic system will be similar to the system developed at the Idaho Nuclear Engineering Laboratory (INEL).

The Waste Preparation Facility is scheduled to be constructed and be operational by the first quarter of FY 87.

3.6.4 TRU Waste Non-Destructive Analysis and Non-Destructive Examination Facility

In the NDA-NDE Facility, the type and quantity of radioactive elements contaminating waste, and nature of the waste matrix will be determined.

Metal drums, retrieved from storage and initially processed in the TRU Waste Preparation Facility at TA-54, will be brought to the NDA-NDE Facility by truck, off-loaded by jib crane or other safe handling means, and placed individually on carts for movement through the facility. The drums then will be subjected to non-destructive analysis and examination. Following this procedure, certified drums of waste will be moved to a staging area in the adjacent TRU Waste Transportation Facility for assembly into configurations for shipment to the WIPP. Drums requiring further processing will be routed to the additional operations.

The NDE will be accomplished by means of 280 KeV maximum energy RTR unit equipped with special features including image enhancement, magnification, video cassette recorder (VCR) recording, and hard copy print capability. The NDA examination will be accomplished by means of a Los Alamos-developed drum assay system using both passive and active techniques. It is also anticipated to use both of these units for quality assurance control, spot checking selected drums of NG CH-TRU wastes for verification of compliance to the WIPP-Waste Acceptance Criteria (WAC).

Only metal drums will be examined in this facility. Steel boxes containing TRU wastes packed at the SRF, or sectioned CMPs from the CMP Saw Facility, will undergo examination and be analyzed by a mobile assay system being developed by Los Alamos.

3.6.5 TRU Waste CMP Saw / Processing Facility

In essence these two facilities are one facility. The facility will initially be constructed as the CMP Saw Facility with the capability of sectioning the existing 158 CMPs containing cemented process solutions, and packaging the sections into DOT 7A approved TRUPACT-efficient boxes. After the campaign on processing the CMPs has been completed (approximately one year), the facility will be decommissioned and decontaminated. It will then be refitted as the TRU Waste Processing Facility with the capability of handling the retrieved drums of plutonium processing waste and placing them in a special glove box line for certification through sorting, shredding, fixation/immobilization, and/or repacking. Other wastes such as HEPA filters, soils, and others where identified as needing immobilization, also will be processed in this facility.

3.6.5.1 CMP Saw

The CMP Saw Facility will section the existing CMPs containing cemented process sludges to meet the WIPP package weight and size restrictions. The 158

CMPs are 0.8 m (30 in.) in diameter, 6.1 m (20 ft.) long, and weigh 4.5 to 6.8 (metric) tonnes (12,000 to 15,000 pounds). To meet the WIPP-WAC, the CMPs must be saw cut to fit in approved steel boxes within the defined weight limits of 2.7 (metric) tonnes (6000 pounds). It is anticipated at this time that the cutting is to be a wet operation, possibly involving an industrial reciprocating saw.

This equipment will be housed in a ventilated and HEPA exhaust-filtered process enclosure. The building itself will be a semi-hardened structure. Materials will be loaded onto a trolley car by gantry crane, and the cut sections will be placed into an approved box at a bag-out port by the same gantry crane with remotely operated grappling hooks similar to log-handling equipment.

Because the carbide or diamond-toothed saw blade must run with a cooling-water spray, the process area will be required to have curbing and a liquid waste collection system. Solids from the cutting operation will be collected in a sump in the liquid drain system where they can be removed, packaged, and immobilized in a cementation process. Liquid wastes will be processed in the central Laboratory liquid treatment plant at TA-50, or may be immobilized in a cementing operation at the process facility.

It is planned if determined to be necessary at the time to utilize the Los Alamos developed mobile assay system to examine planned cutting points for metallic debris in the waste that could damage the cutting equipment.

3.6.5.2 Processing

Processing involves opening the containers and inspection, sorting, shredding, and cement fixing of TRU process wastes. This waste, contained in metal drums, generally contains the highest gram loadings of TRU elements. Drums will be retrieved and opened in a special glove box line; the waste will be sorted, and either bagged-out for incineration or direct certification, or shredded and subsequently fixed in a cement mix to maintain safe handling and meet WIPP-WAC requirements.

This facility will contain a glove box line for opening waste containers and sorting the contents for routing to the various processes, an immobilization line, a line to pretreat process wastes, and a shredding line.

The sorting line will be used for opening incoming waste drums, segregating combustible and noncombustible wastes, and examining the unknown wastes that are uncategorized by the nondestructive examination techniques. A small fork-lift truck with drum-handler

attachments will be used for materials handling within the facility.

The immobilization line will be designed to immobilize soils, construction debris, grindings and chips from the CMP-Saw Facility, shredder, and pretreated process wastes. Immobilization agents will be fed to the mixer by means of a materials bin and an auger or vibrator transport system.

The receiving area, three glove box lines, and a shipping area will require a building approximately 363 m^2 (3920 ft^2) and will include personnel support areas and materials storage. The building will require ventilation control, HEPA-filtered exhaust, and industrial waste-water collection.

3.6.6 TRU Waste Transportation Facility

The TRU Waste Transportation Facility will accommodate opening, loading, closing, and inspection-testing capabilities for TRUPACTs. It is a standard design warehouse. To optimize TRUPACT loads, the warehouse will need to be big enough to store up to five TRUPACT volumes plus the drum six-pack assemblies, and to allow fork-lift truck maneuvering. No special ventilation except to discharge diesel truck smoke exhaust would be required, because only certified, sealed waste packages are to be in this facility.

The loading will be by gantry crane for on-truck loading of the TRUPACT.

The transportation operations section of the NDA-NDE/Transportation Facility has approximately 301 m^2 (3240) ft^2 with the exterior walls being also constructed of concrete masonry. The the NDA-NDE/Transportation Facility will be approximately 24.7 m (81 ft) by 12.2 m (40 ft) in size.

3.7 Detailed Operating Schedules and Throughputs

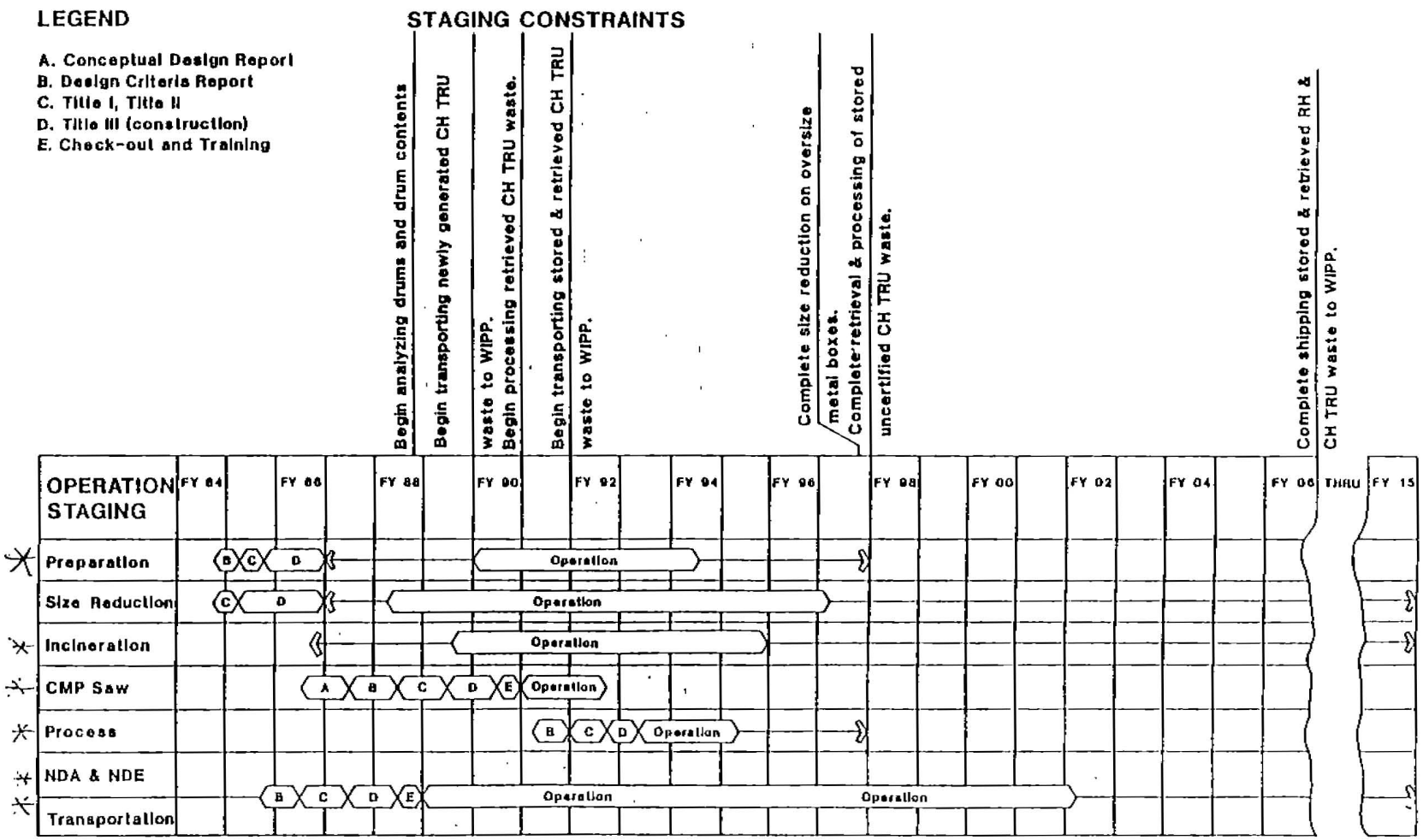
The overall schedule of providing and operating the TRU Waste Work-Off Facilities at Los Alamos is shown in Figure 7. The flow sheets represented by Figures 5 and 6 also reflect the interaction between the various TRU Waste Work-Off Facilities and operations.

A summary of the total throughputs of the numerous work-off facilities and/or operations is reflected on Table 12.

3.8 Facilities and Equipment Required for Continued Retrievable Storage

Of the four currently constructed above-ground storage pads, two are completely filled, one is about 25% full and the fourth, currently used for certified waste, is essentially empty. Los Alamos has sufficient storage area currently available and no problems in the implementation of the IWOP are anticipated.

We have physical access to the interior of each of the pads for inspection and monitoring purposes. As of June, 1986, Los



OPERATION STAGING
FACILITY STAGING
STRATEGY

TRU WASTE INVENTORY
WORK-OFF FACILITIES

FIGURE 7

Los Alamos

Lab Job No: 7541-0 Date: 6 13 86
Holmes & Narver, Albuquerque, NM
H&N Job No. 1644.70 H&N Task No. 136

75

FROM	TO	VOLUME (m^3)
Transportation	WIPP	14335
New waste generated at TA-3, 50, 55	Transportation	8175
Uncertified Storage at TA-54	Preparation	6795
Preparation	NDA & NDE ④	4556
NDA & NDE ④	Transportation	3139
Certified waste holding	Transportation	2891
New waste generated at TA-3, 50, 55	Incineration	2635
NDA & NDE	Certified waste holding	2396
Preparation	Size reduction	2239
New waste generated at TA-3, 50, 55	Size reduction	1740
Size reduction	NDA & NDE ①	995
CMP Saw	NDA & NDE ①	900
Processing	NDA & NDE	805
NDA & NDE	Incineration	785
NDA & NDE ④	Processing	700
New waste generated at TA-3, 50, 55	Certified waste holding	625
Uncertified storage at TA-21	CMP Saw ③	442
New waste generated at TA-3, 50, 55	Uncertified waste holding	325
NDA & NDE ④	LLW burial	310
Uncertified storage at TA-21	LLW burial ②	190
Uncertified storage at TA-54	TRU burial (gcd)	116
Incineration	NDA & NDE	74

VOLUME OF NEWLY GENERATED AND STORED WASTE IN TRANSIT DURING WORK-OFF PERIOD CY 86 THRU CY 15

TRU WASTE INVENTORY WORK-OFF FACILITIES

TABLE 12

NOTES:

① NDA & NDE is mobile crate system to be set up at TA-54

② Completed during 1985

③ Moved to TA-54 during 1986

④ NDA-NDE includes use of mobile system set up at TA-54 for some waste in crates

Los Alamos Los Alamos National Laboratory Los Alamos, New Mexico 87545

Lab Job No.: 7641-0 Date: 6-15-86

Holmes & Narver, Albuquerque, NM

H&N Job No.: 1644.70 H&N Task No: 136

Alamos has made two such inspections and no significant container damage or deterioration has been detected. During the first quarter of FY 86, an investigation of subsidence in a small area of Pad No. 1 showed damage to at least four FRP-coated crates. Efforts are in progress to correct this situation. We will continue to inspect our retrievable storage sites in order to provide assurance that we are in complete compliance with all storage requirements.

Based on all evidence to date, no significant additional anticipated activities, facilities, or equipment will be required to maintain retrievable storage at Los Alamos.

4.0 Work-Off Strategy and Schedule

The overall strategy to be used at Los Alamos National Laboratory (Los Alamos) for the work-off of stored retrievable transuranic (TRU) wastes will be based on integrating available facilities and existing operations with those required for certification and transport of newly generated (NG)-TRU wastes to the Waste Isolation Pilot Plant (WIPP).

Several years ago, in anticipation of the need of improved waste management practices, Los Alamos constructed or upgraded several facilities that treated or processed selective wastes by volume reduction where it was cost effective and/or was required. These facilities consisted of the Size Reduction Facility (SRF), the Controlled Air Incinerator (CAI) in the Treatment Development Facility (TDF), and the Radioactive Liquid Waste Treatment Plant.

In the operation of proposed future facilities, as much retrievable TRU wastes as possible will be certified for shipment to the WIPP by Nondestructive Analysis-Nondestructive Examination (NDA-NDE) means. The size of the proposed facilities will be minimized, and their operating costs reduced, by phasing and sequencing operations and by the integration of NG-TRU waste operations with stored waste operations and facilities.

4.1 Contact-Handled TRU Wastes Strategy for Facilities and Equipment

The strategy used at Los Alamos for the work-off of stored retrievable TRU waste is based on integrating available

facilities and existing operations with those required for the certification and transport of NG-TRU waste to the WIPP. The operations described below will be required to retrieve, certify, and transport existing TRU waste from Los Alamos to the WIPP. These operations will also provide the means to handle NG-TRU waste. However, it will be the responsibility of the waste generators to prepare NG-TRU waste to meet the WIPP Waste Acceptance Criteria (WAC). Only NG-TRU waste requiring special handling, such as size reduction or incineration, will be processed and certified by the Waste Management Group, Health Safety and Environment (HSE)-7.

4.1.1 Size Reduction

Large metallic waste items, particularly decommissioned glove boxes, will be sectioned to reduce the size and volume of the waste to be transported to the WIPP. Retrieved waste is uncrated and introduced into a process enclosure. A bridge crane, a turntable, and an electromechanical manipulator position the item for cutting by a plasma arc torch. The resulting sections are moved to the bag-out port and placed in a Department of Transportation (DOT) 7A-approved TRUPACT-efficient box for shipment.

4.1.2 Incineration

Combustible wastes will be processed in a high temperature CAI to reduce volume, stabilize chemical composition, and eliminate combustibility of defense TRU

wastes. Retrieved waste containers are opened in a glove box line and the contents sorted. Combustibles are placed in the incinerator and non-combustibles are repackaged and certified by other means. Following incineration, the ash is packaged through a bag-out port and placed into DOT 7A-approved TRUPACT-efficient boxes for shipment.

4.1.3 Preparation

Retrieved packages of TRU waste will first be processed in the Waste Preparation Facility for (1) removal of earth and/or a bituminous corrosion protection coating from metal drums and Fiberglas Reinforced Polyester (FRP)-coated crates, (2) analysis of the structural integrity of the containers, (3) the overpacking of structurally deficient containers, and (4) the staging of containers for the next step in the work-off process. Metal drums and FRP-coated crates will be brought to the Preparation Facility following retrieval at Technical Area (TA)-54 to be steam cleaned to remove earth and, in the case of metal drums, a bituminous corrosion protection coating. Following this cleaning, the containers will be analyzed either visually or by ultrasonic equipment to assess their structural integrity. Structurally deficient containers will be overpacked to maintain handling and transportation safety. Finally, containers will be moved to a staging area to be readied for the next step in the work-off process.

4.1.4 Non-Destructive Analysis and Non-Destructive Examination (NDA-NDE)

This operation will define the physical composition of the TRU-contaminated waste inside the package and the specific identity and quantity of TRU contaminants, and will provide for the certification of waste requiring no further processing. Containers of certified NG-TRU wastes from all waste streams and waste generators will be selected at random to verify the certification processes.

4.1.5 CMP-Saw

Cement-filled corrugated metal pipes (CMPs) will be sectioned to meet the WIPP container weight and size restrictions. CMPs are 0.8 m (30 in.) in diameter, 6.1 m (20 ft) in length and weigh 4.5 to 6.8 (metric) tonnes (12,000 to 15,000 lbs.) To be certified, the CMPs must be saw-cut to 1.2 m (48 in.) lengths or otherwise sectioned to fit in to the DOT 7A-approved TRUPACT-efficient box within the WIPP defined weight limits.

4.1.6 Processing

In the Processing Facility, waste drums will be emptied and the contents sorted for additional processing and/or cement fixing of the TRU waste. Drums, many containing materials near the upper limit of nonrecoverable TRU wastes (200 g plutonium-239 or 20 g americium-241), will be opened in a glove box line, sorted, with the contents either

bagged-out for incineration or direct certification, or shredded and encased in a cement mix to maintain handling safety.

4.1.7 Transportation

The Transportation Facility will serve for the staging, arranging into six-pack configurations, and loading of certified waste containers, either 210 L (55 gal.) metal drums or steel boxes, into a TRUPACT. Inspection and testing of the sealed TRUPACT must also be accomplished prior to shipment to the WIPP.

4.2 Contact-Handled Schedules

Of the seven facilities outlined above, Los Alamos has two currently on line and five will be brought on line to fulfill the strategy outlined in this plan.

On Line Operations	Future Operations
1. Size Reduction	3. Preparation
2. Incineration	4. NDA-NDE
	5. CMP-Saw
	6. Processing
	7. Transportation

The detailed work-off waste flow diagram is shown in Figure 8. This figure presents the proposed work-off schedule with material balances between operating segments on an annual basis. The dates of the various activities associated with these facilities correspond with those shown

in Figure 7 of this report. All numerical values on figures and tables in this Inventory Work Off Plan (IWOP) are in units of cubic meters (m^3).

Various assumptions have been used in determining the scheduling and material balance figures; these are discussed in the following sections where detailed operations strategies are presented on a facility-specific basis. The total inventory of CH-TRU waste in storage as of the end of 1985 was 6586 m^3 (232 552 ft^3) at the TA-54 site and 442 m^3 (15 617 ft^3) at the TA-21 site. The TA-21 site's TRU waste consists of the cemented sludge CMPs that will go to the CMP-Saw Facility when it becomes operational. These CMPs will be moved to TA-54 for temporary holding during Fiscal Year (FY) 86.

4.2.1 Uncertified NG-TRU Wastes

Newly generated waste that is not certified will continue to be placed into retrievable (uncertified) storage at the TA-54 site through FY 86. After FY 86, no significant volume of uncertified TRU waste is expected to be generated.

The inventory of uncertified waste stored at TA-54 is also shown on Figure 8. This waste volume increases through FY 86 due to additions from NG uncertified streams. The volume of stored uncertified waste at TA-54 starts to decrease beginning in FY 87 and continues to do so until the

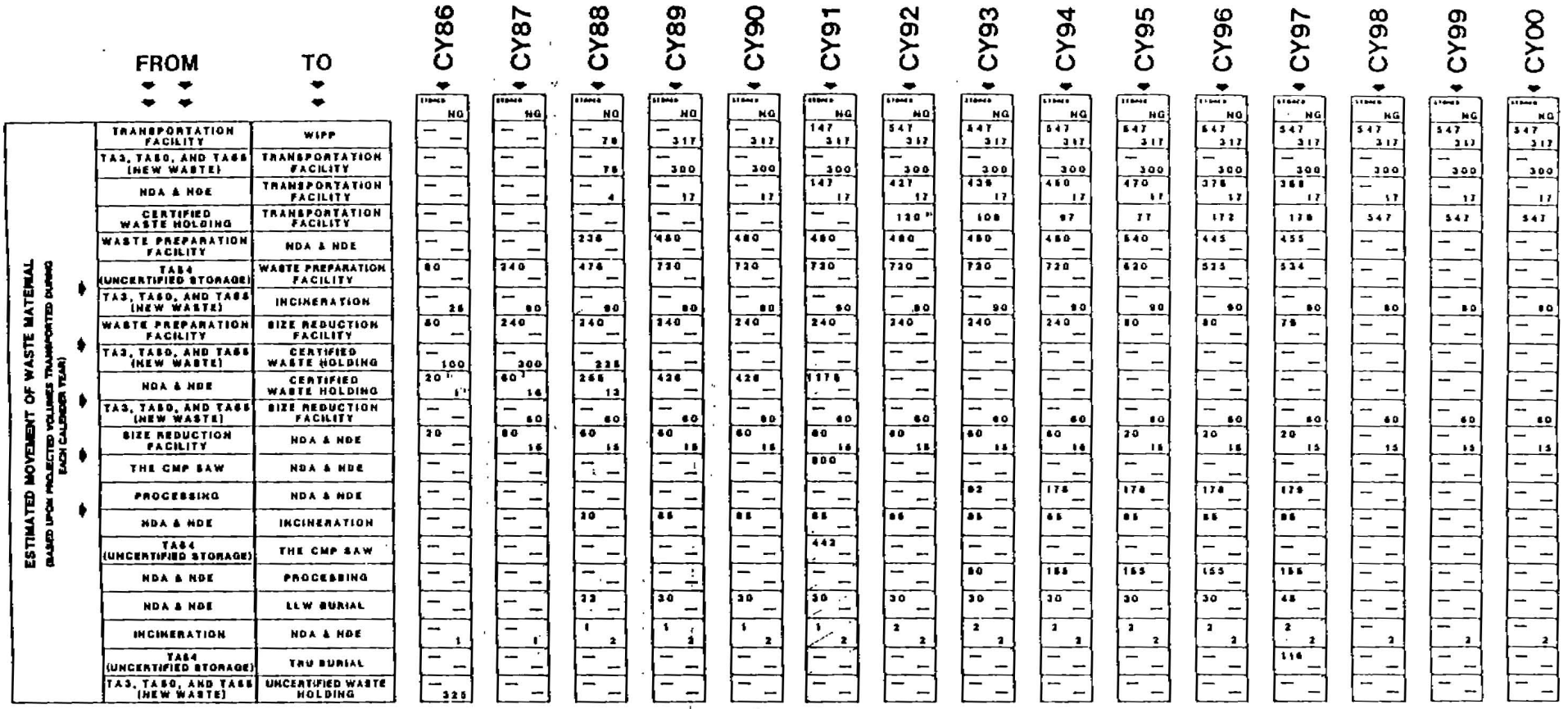
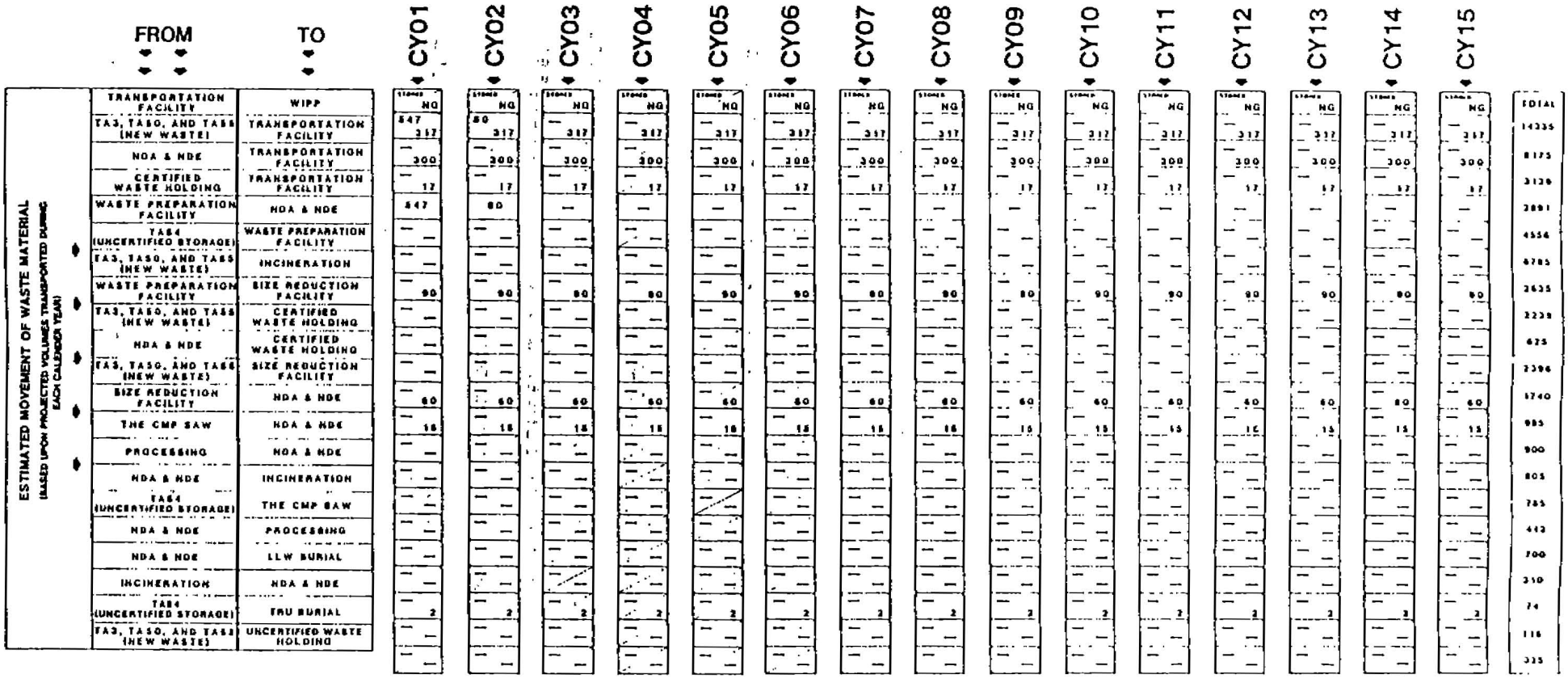


FIGURE 8

PROCESS RATES FOR NEWLY GENERATED AND STORED TRU WASTE DURING WORK-OFF PERIOD CY86 TO CY15

TRU WASTE INVENTORY WORK-OFF PLAN

Los Alamos



NOTES: ① Material has undergone additional processing and is considered "certifiable", awaiting only the availability of the Los Alamos Mobile Crate Assay System.

② Material has undergone various types of additional processing, changing its physical/chemical properties to meet WIPP-WAC. The material is just awaiting shipment and is no longer considered newly-generated or stored.

FIGURE 8 (cont.)

PROCESS RATES FOR NEWLY GENERATED AND STORED TRU WASTE DURING WORK-OFF PERIOD CY86 TO CY15

TRU WASTE INVENTORY WORK-OFF PLAN

Los Alamos

end of the work-off period in FY 97, when all uncertified waste has been retrieved and processed.

4.2.2 Preparation

The TRU Waste Preparation Facility is designed to clean and verify the integrity of one 210 L (55 gal.) drum every 20 minutes. Based on the availability of 250 8-hour working days per year, the facility could have a theoretical throughput of 6000 drums per year, or 1250 m^3 (44 125 ft^3). However, based on the operating experience of other waste facilities, 198 available working days is more realistic, resulting in a maximum throughput of approximately 4750 drums, or 990 m^3 (34 947 ft^3). This is 79% of the maximum theoretical capacity. A throughput of 720 m^3 (25 416 ft^3) or about 73% of design capacity is required to meet the IWOP.

This facility will be operated in a "batch" mode in that retrieval operations will be conducted approximately once per month, with the retrieved waste then processed through the facility. Other assumptions made are: (1) if FRP-coated crates are being processed, the volume being handled is roughly that of scheduled drums; and (2) the 198 available working days includes 4 hours per week downtime for maintenance.

4.2.3 Size Reduction

Based on operating experience to date, the maximum actual throughput of the TRU Waste SRF is approximately

300 m^3 (10 594 ft^3) per year; the SRF has experienced a considerable amount of downtime due to modification and maintenance. However, only a throughput of 240 m^3 (8475 ft^3) per year, 80% of maximum operating capacity is necessary to meet this IWOP. The waste volume reduction factor in the facility has averaged 4:1. The SRF will be operated in a "continuous" mode.

The assumptions made are: (1) that modifications made to the operations, equipment, and processes will reduce downtime; and (2) that the 20% reserve capacity will be utilized to process NG-TRU wastes.

4.2.4 Incineration

The TDF which houses the research and development (R&D) CAI is an online facility. To meet this IWOP, the incinerator must be operated for approximately three 2-week periods per year, two for NG-TRU and one for retrieved waste. These are 24-hour continuous operating periods. An additional week is required for each startup and another week is required for each shutdown and cleanout. This amounts to 25% of the total operating capacity to process the required TRU waste. The waste volume reduction factor, input/output, is 50:1.

It is assumed that with the 24-hour continuous operation of the TDF that there will be sufficient staff to maintain all other functions related to the operation of the

incinerator. During the year, the CAI also is planned to be used for operations involving other (non-TRU) waste streams, and for continuing R&D purposes.

4.2.5 NDA-NDE

The TRU Waste NDA-NDE Facility is designed to analyze the contents, by means of an active/passive drum assay system, and examine the contents, by means of a realtime x-ray radiography system, of one 210 L (55 gal.) drum every 20 minutes. Where possible, direct certification of waste is intended through these and the previous examinations.

Of the waste volume passing through NDA-NDE, approximately 10% is combustible waste that will be processed in the CAI at the TDF. Only about 4.4% of the waste overall is expected to be determined as non-TRU under the present guidelines and will be disposed of at the Los Alamos low-level waste burial area.

Any wastes identified as requiring additional processing for certification will be returned to uncertified waste storage. This operating mode continues until FY 93 when the TRU Waste Processing Facility comes on-line. Once operational, these uncertified wastes will be routed from the NDA-NDE Facility to the Waste Processing Facility for the additional processing required to meet the WIPP WAC.

Based on the availability of 250 working days per year, this facility could have a theoretical throughput of 6000

drums per year, or approximately 1250 m^3 (44 125 ft^3) of waste. However, based on the operating experience of other waste facilities, 198 available working days is more realistic, resulting in an actual throughput of approximately 4750 drums or 990 m^3 (34 947 ft^3) of waste. This is 79% of maximum theoretical design capacity. A throughput of approximately 662 m^3 (23 370 ft^3), or about 67% of design throughput capacity, is required to meet this IWOP. The waste volume reduction factor in the NDA-NDE Facility is about 1.1:1, where the reduction in TRU waste volume results from identification of low-level waste for burial.

Qualified personnel will be available not only to operate this rather sophisticated equipment, but also to interpret the resultant data required for certification. An additional function of NDA-NDE will be random verification of some NG-TRU received from Laboratory generators.

4.2.6 CMP Saw

The TRU waste CMP Saw Facility is being designed to cut to size and package four CMPs per week. This also allows for one day per week for cleanup and maintenance, and for a two week shutdown during the year, for a theoretical design throughput of 200 CMPs, or 560 m^3 (19 776 ft^3) of waste. The required throughput of 442 m^3 (15 607 ft^3) is approximately 80% of the design capacity. The waste volume

reduction factor for this facility is about 1:2, or a doubling of waste volume due to packaging in WIPP boxes. The CMP Saw Facility will be operated in a "continuous" mode during the campaign of processing and packaging of the CMPs. It is expected the work will be slow and the equipment will require a considerable amount of maintenance.

4.2.7 Processing

The TRU Waste Processing Facility has a theoretical design throughput of 300 m^3 (10 594 ft^3) per year, or approximately 1500 drums, based on 250 available working days. However, based on operating experience of other waste facilities, a year of 198 available working days is more realistic resulting in an actual throughput of approximately 1200 drums, or approximately 250 m^3 (8825 ft^3) of waste. This is 79% of maximum theoretical design capacity. However, the actual throughput needed to meet this IWOP is only 155 m^3 (5472 ft^3) per year or 62% of design throughput capacity. The waste volume reduction factor for the Processing Facility is 1:1.15, or a slight increase in waste volume due to packaging requirements. The Processing Facility will be operated in a "batch" mode to maintain TRU inventory within limits established.

It must be recognized that in order for the Processing Facility to come online on schedule, the CMP-Saw Facility must be constructed on schedule, the campaign to process the

CMPs must meet milestones, and decommissioning and retrofitting of the CMP Saw Facility must be completed on schedule.

4.2.8 Transportation

For maximum efficiency in operations, the TRU Waste Transportation Facility is all but mandated to ship two TRUPACTs of NG-TRU and retrieved waste to the WIPP each week for a total of 100 loads, or approximately 864 m^3 (30 511 ft^3) of waste per year during the period of FY 92 through FY 02. All NG certified wastes will be shipped to the WIPP once it becomes operational in FY 89, with waste from the stored waste work-off being shipped beginning in FY 92. The volume of one TRUPACT is 24 m^3 (847 ft^3). A 36% average loading efficiency is used in all calculations for a resultant usable volume of 8.64 m^3 (305 ft^3) per TRUPACT. This is based upon 50 shipments containing six 6-packs, and 50 containing four 6-packs and two metal boxes per year. Proposed changes in DOT criteria could reduce the payload by an additional 17%. To meet the requirement for shipment of 100 TRUPACTs per year, the facility will operate at 74% of maximum design capacity. The remainder of the available time includes 2 weeks scheduled downtime, and one day per week for cleanup, maintenance, weather, and truck/TRUPACT related problems. The Transportation Facility will operate in a "continuous" mode. The waste volume reduction factor is 1:1, or no change.

Two assumptions are made that are not under the control of Los Alamos; these are: (1) that sufficient trucks are available despite labor problems or weather; and (2) that sufficient TRUPACTs in good working condition are available.

4.3 Remote-Handled TRU Waste

4.3.1 Newly Generated Remote Handled TRU Wastes

Remote Handled (RH)-TRU wastes constitute only a small fraction of the total Los Alamos newly generated TRU waste. The only facility currently producing RH-TRU waste is being shut down and cleaned out. RH-TRU waste output will cease after the existing inventory of experimental materials have been processed and the residues from decommissioning and decontamination have been removed. These wastes will be in a form that is acceptable at the WIPP, but the existing facility is not suitable for packaging the waste in the RH canister without signigicant equipment modifications that are not included in the decommissioning budget (DOE-Energy Programs funded). To the extent practical, these wastes would be packaged in containers that are compatible with the current RH canister. NG RH TRU wastes would not be generated after FY 90.

4.3.2 Stored Remote-Handled TRU-Wastes

Remote Handled (RH)-TRU wastes constitute only a small volume 29 m^3 (1024 ft^3) of the total Los Alamos currently stored TRU waste inventory. These RH-TRU wastes are

contained in a variety of package types, only a portion of which will currently fit in the RH canister for shipment to the WIPP. These wastes will need to be evaluated on a "package-by-package" basis to determine the possible means and practicality of certification.

A portion of the currently stored RH TRU-waste being held at TA-54 is already sealed in concrete-metal casks. Even though a number of these casks, 11 of 24, are potentially compatible with the RH canister, they are perhaps easier to deal with as special case (SC) TRU-wastes (see section 4.4). The remaining portion of currently stored RH-TRU waste, about 1 m^3 (35 ft^3), is in containers compatible with the RH canister. There are several options available to us in disposing of it as follows:

- The wastes could be certified at Los Alamos using recently developed mobile NDE equipment. This would be undertaken or completed after FY 97. It is impossible to define facility and equipment needs at this time. New facilities likely would be required, and the cost would be extremely expensive for a very small volume of wastes.
- The wastes could be shipped off-site to a centralized RH waste handling facility, for example Oak Ridge National Laboratory (ORNL), for certification, and there packaged in the RH canister. Our RH-TRU

waste packages would be retrieved loaded into appropriate casks, and shipped. This would not likely occur until after FY 97, although there is a possibility that the wastes could be shipped before FY 97 if required.

4.3.3 Proposed Alternative

A proposal has been made to the Department of Energy (DOE) Joint Integration Office (JIO) and Interim Waste Operations (IWO) to provide assistance to the operator of the existing hot cell facility, so that RH-TRU waste can be canisterized during the close-out operations. In essence, we would use the existing Los Alamos TRU Hot Cell Facility to certify and repackage all of the currently stored "readily certifiable" RH-TRU wastes in the RH canisters, package the NG RH-TRU decommissioning wastes appropriately in the RH canisters, and then subsequently work our way out of the hot cells by cleanup, decontamination, and decommissioning. All of this effort on the currently stored and NG /RH-TRU wastes would be completed by the end of FY 90. Certified canisters of RH-TRU waste then would be soted until shipment to the WIPP is scheduled.

If this effort is not supported, all the NG RH-TRU decontamination and decommissioning wastes will be placed in retrievable storage at TA-54.

4.4 Special Case (SC) TRU wastes

There are some very small volumes of waste, both CH and RH, that cannot reasonably meet the criteria for certification. One option, the most realistic identified to date, is greater confinement disposal (GCD) burial at the Los Alamos Disposal Site for terminal storage. Wastes currently identified as CH-SC TRU wastes include massive metallic objects and machine tools that cannot be processed in the SRF. The currently identified volume of SC RH-TRU waste is 17 m^3 (600 ft^3); however, this volume will become 27 m^3 (953 ft^3) if the 11 canisters potentially able to be overpacked cannot be so processed.

Not all of the Los Alamos SC wastes are currently in one location at Los Alamos; they are mixed throughout the stored TRU inventory. GCD burial would consolidate the waste into one specific location. As the normal work-off operations proceed, these wastes will be retrieved and examined to determine if there is indeed no practical means of preparing them for the WIPP. They then will be held in temporary storage mode and appropriate disposal will be accomplished on all the SC wastes at one time. No decision on their final disposal will be made until after FY 97. The currently identified disposal options include: (1) on-site burial (GCD); (2) an exemption from the WIPP; and (3) an additional processing capability. The exact magnitude and possible solutions for these wastes will be addressed following the work-off effort (FY 97) on a case-by-case basis.

Table 13

Los Alamos Milestone Comparison with "Long Range Master Plan for Defense Transuranic Waste Management"

	Milestone	LRMP	Los Alamos
1.	Initiate certification of new RH waste	2/86	9/86
2.	Complete estimate of Los Alamos WIPP transportation needs	8/86	8/86
3.	Complete Los Alamos Stored CH Waste Management (Inventory Work-Off) Plan	9/86	9/86
4.	Complete certification plans for stored waste	3/88	3/88
5.	Begin shipping new CH waste directly to WIPP	10/88	10/88
6.	Begin shipping stored/retrieved CH waste to WIPP	10/91	10/91
7.	Begin shipping new RH waste directly to WIPP	1/94	*
8.	Begin shipping precertified RH waste to WIPP	1/94	1/94
9.	Complete size reduction on oversize boxes of metal stored	9/97	9/97
10.	Complete retrieval and processing of stored/not-precertified CH waste	9/97	9/97
11.	Begin retrieval of stored not-precertified RH waste	8/99	8/99
12.	Complete retrieval and processing of stored/not-precertified RH waste	10/06	10/06
13.	Complete shipping stored/retrieved RH waste to WIPP	10/06	10/06
14.	Complete shipping stored/retrieved CH Waste to WIPP	10/13	10/02

* Los Alamos will not generate new RH-TRU waste after FY 90 per current program guidance.

4.5 Comparison with Planning Documents

A comparison of Los Alamos milestones with those listed in the "Long Range Master Plan for Defense Transuranic Waste Management" is shown in Table 13. The only significant milestone difference is that, per current schedules, all stored/retrieved CH-TRU will be sent to the WIPP by October, FY 02.

4.6 Potential Problems That Could Impact Schedules and Strategies.

By far the most important factor that could affect Los Alamos Work-Off planned schedules and strategies is the availability of adequate funding. Many of the facilities and operations are being planned or constructed with what is now the minimum amount of funds. Any further reduction in funding would have serious consequences on the overall IWOP.

Any "unforeseen surprises" could also have a serious effect on the overall IWOP. The facilities are all designed and being built to existing or known proposed changes in regulations and requirements. Changes in DOE requirements for on-site transportation of radioactive materials could significantly impact the costs and/or our ability to move waste to a required treatment facility. DOT final shipping requirements for wastes to the WIPP in the TRUPACT appear not to be totally resolved at this time, and could have a very serious impact. Shipment of waste to the WIPP assume the availability of the TRUPACT; schedule delays in shipping will occur if TRUPACTs are not available in sufficient quantity.

In the area of certification, we are assuming several waste forms will be certified without further processing, as for example, the vacuum-filtered liquid waste treatment sludges [3500 drums or approximately 735 m^3 (25 956 ft^3)]. A major program impact certainly would occur if this or other significant volume waste streams could not be certified by NDA-NDE means alone.

5.0 Resource Requirements

5.1 Facilities Construction

Modifications to two existing facilities, the Size Reduction Facility (SRF) and Treatment Development Facility (TDF), are being completed in Fiscal Year (FY) 86. Department of Energy (DOE) Interim Waste Operations (IWO) General Plant Projects (GPP) funding was provided in FY 84 for these projects. The final total project cost is approximately $500K, of which $400K was provided by IWO in FY 84, with the approximately $100K balance derived from an accumulation of past years uncommitted funding.

The Transuranic (TRU) Waste Preparation Facility is an FY 85 IWO GPP-funded project, scheduled for completion in late FY 86. The total Waste Management GPP funding provided is $300K.

New facilities required for the Inventory Work-Off task for contact-handled (CH)-TRU wastes to be provided in FY 86 and beyond include the TRU Waste Preparation, Nondestructive Analysis - Nondestructive Examination (NDA-NDE), Corrugated Metal Pipe (CMP) Saw, Processing, and Transportation Facilities. Construction costs for these facilities are totaled in this Inventory Work-Off Plan (IWOP) rather than being prorated with other uses as the facilities are mandated by the retrieval effort. Examples of the joint use facilities are the Size Reduction Facility (SRF) and Treatment Development Facility (TDF) Controlled-Air Incinerator (CAI), which are currently being modified, and the TRU Waste Transportation Facility which is to

be constructed. This also accounts for the seemingly out-of-sequence construction schedules, because these facilities are required before the IWOP schedules are completed.

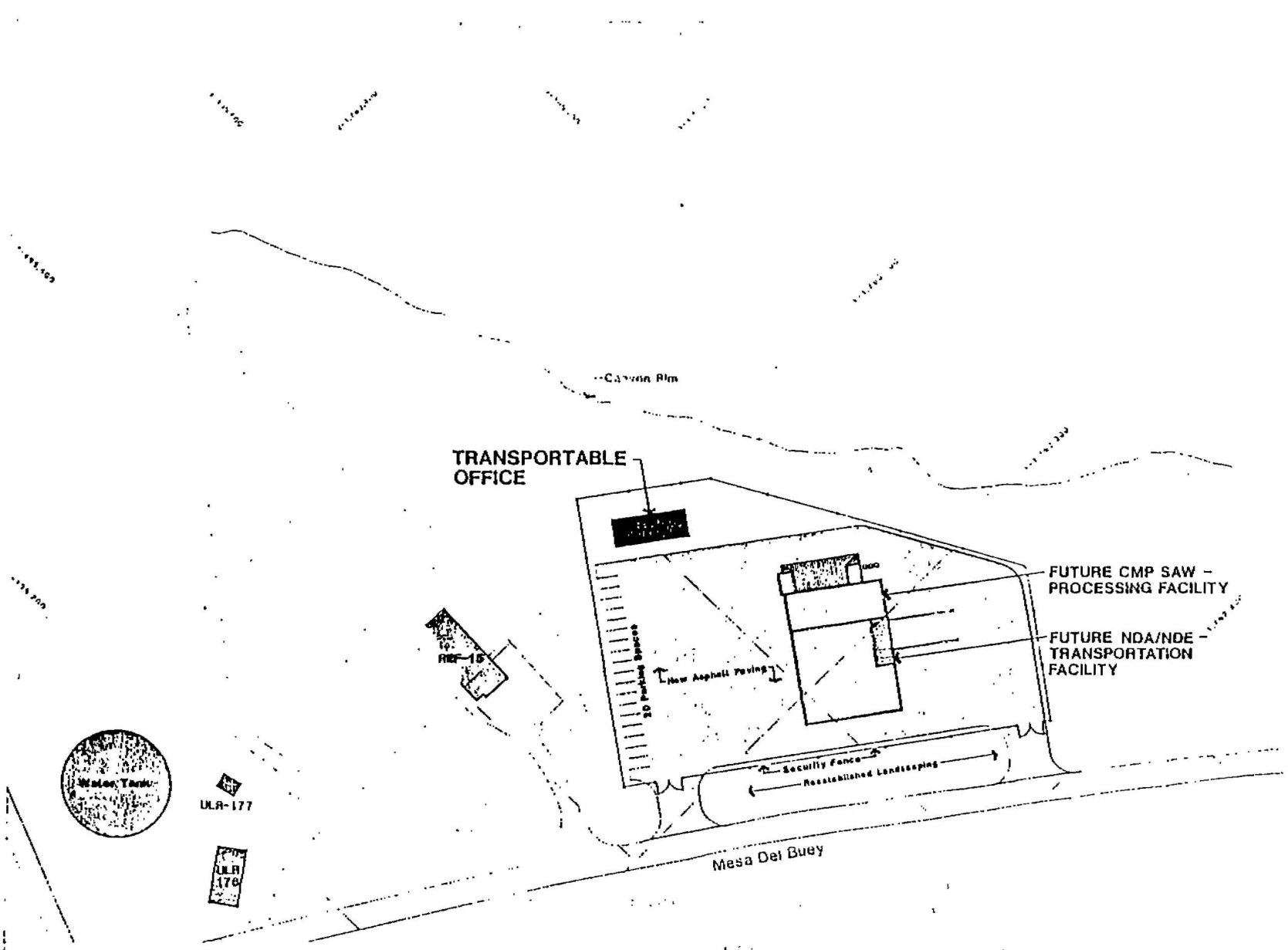
The construction schedule, shown previously in Figure 7, should permit an orderly progression of construction using Waste Management (IWO) GPP funding. The construction costs for all of the work-off facilities are summarized in Table 14. These construction cost estimates have been provided by the Architects/Engineers (AE), Holmes and Narver, as a part of their overall planning design work completed during the period 1983-86. All costs are presented in FY 86 constant dollars for the years beyond FY 86. Contingency funding is included in all projected construction and equipment costs for these projects.

Details associated with the construction cost estimate for each facility follow.

5.1.1 Site Improvements

Figure 9 shows the functional relationship of the NDA-NDE/Transportation, CMP Saw/Processing, and support facilities required at the approved Technical Area (TA)-54 location for these work-off-related operations. Under the FY 86 funded site improvements project, all of the site work required for the work-off facilities will be provided.

Two new 10.7 m (35 ft) wide site entrances and driveways from Mesita Del Buey Road will be provided to allow for the pass-through of the semi-trailer and tractor



SITE PLAN

North

0 40 80 120 160

Feet

LEGEND

REF-15	Animal Holding Facility
ULR-176	Pajarito Pump Station No. 2
ULR-177	Clorinator Building

This drawing is intended solely to illustrate basic design concepts and criteria.

FIGURE 9

TRU WASTE SITE IMPROVEMENTS AT TA-54

Los Alamos National Laboratory
Los Alamos, New Mexico 875

Lab Job No.: 7641-0 Date: 4-30-

Holmes & Narver, Albuquerque, NM

H&N Job No.: 1644.20

Funding Schedule - Facilities Construction

	Fiscal Year					
	1984	1985	1986	1987*	1988*	1991*
SRF	$325K CONST					
TDF	$175K CONST					
PREPARATION		$300K CONST				
FACILITIES SITE PREP			$525K CONST			
NDA-NDE/TRANS				$1075K CONST $1560K EQUIP		
CMP SAW					$ 962K CONST $ 380K PROC/EQUIP	
PROCESS						$ 430K CONST $1180K PROC/EQUIP

*ALL COSTS IN FY 86 DOLLARS

TABLE 14

which will carry the TRUPACT to the Transportation Facility. This is the maximum limiting vehicle size and load limit. Provision for a 18 925 L (5000 gal.) tanker trailer to move low activity aqueous wastes from the CMP Saw/Processing Facility to the TA-50 Radioactive Liquid Waste Treatment Plant will be made. The new site entrances will accommodate a drainage swale parallel to Mesa Del Buey Road. Parking is estimated on the basis of providing one space per employee with the number of employees estimated at twelve persons, with added spaces for government vehicles (four), and visitors (four).

An engineered earth fill is required to make this area suitable for the future facilities and vehicular circulation. Borrow is calculated at approximately 23 405 m^3 (30 600 yd^3) and will be obtained from TA-54. New retaining walls are required at the vehicle entrances to integrate this earth fill with existing contours and to provide a new drainage swale along the northeast side of Mesa Del Buey Road as noted above. Grading will provide surface run-off of storm water.

New utility services required for the office, NDA-NDE/ Transportation, and CMP Saw/Processing Facilities will be extended from existing services. Utilities provided will include the following:

- o Domestic Water
- o Fire Protection Water
- o Electricity
- o Telephone
- o Communication
- o Sanitary Sewer

Domestic and fire protection water will be obtained from the existing 15.2 cm (6 in.) water line located southwest of the Animal Facility (TA-51-15). A new 3800 L (1000 gal.) septic tank and associated drain field will be installed to meet sanitary sewer requirements. Electrical service will be obtained from existing power pole 2221. Power lines will be extended overhead approximately 107 m (350 ft) east and southeast to a new transformer and switchgear station. Secondary service will be extended underground to the electrical rooms associated with each new facility. Communication services for the new buildings will also be obtained at pole 2221. Service will be supplied overhead along with the new power line. Again, at the time each facility is constructed, communications services will be extended underground from the new substation area to the appropriate telephone rooms. Natural gas service will not be provided to the new site; electrical power will be utilized for heating.

A single story, approximately 149 m^2 (1600 ft^2) office facility will be provided at the site in FY 86. This facility will serve as the base of the TRU work-off program effort.

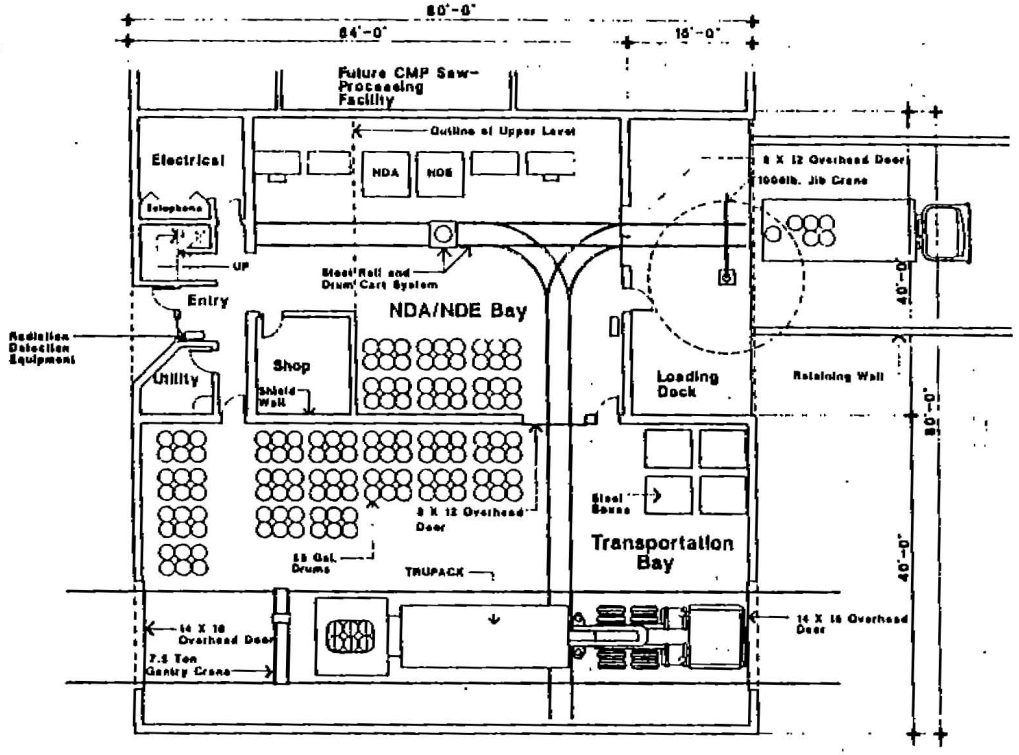
The current total estimated FY 86 expenditure for the above work/facilities is $525K.

5.1.2 NDA-NDE/Transportation

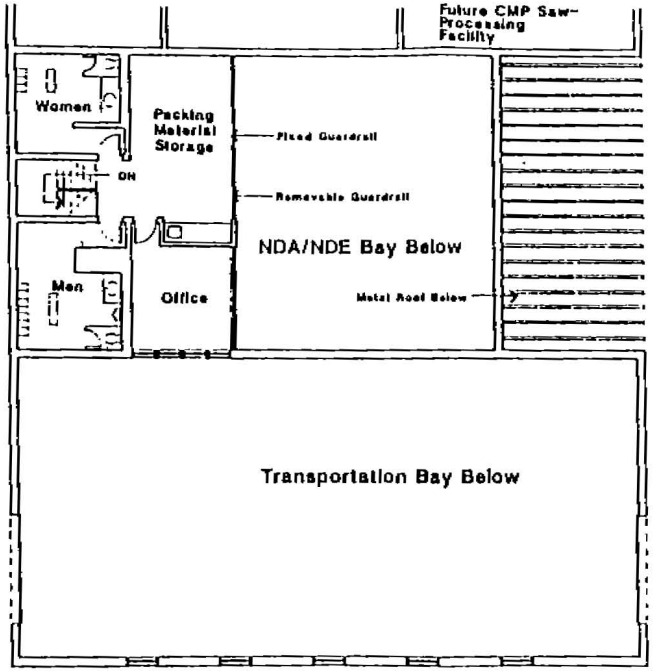
The draft Design Criteria for the NDA-NDE/ Transportation Facilities, completed in May 1986 by the AE, Holmes and Narver, has these two facilities sharing the same building structure. Reasons for sharing the same building include the following:

1. Both NDA-NDE and transportation operations have a low probability of contamination release and thus require basically the same levels of containment, ventilation control, and building services.
2. The significant fraction of waste that can be certified directly through NDA-NDE can proceed in an efficient manner to Transportation.
3. In a properly designed building, each of these operations can be performed independently of one another without one adversely impacting the other.

The combined NDA-NDE/Transportation Facility is a warehouse-type structure of standard design. External facility walls are proposed to be constructed of concrete masonry. The floor plans and elevations and section, as proposed by the AE, are shown in Figures 10 and 11, respectively. Because only cleaned, surveyed, and sealed



FIRST FLOOR



UPPER LEVEL

FLOOR PLANS

North

0 4 8 16 24 32

Feet

NOTES

Jib Crane and Steel Rail Drum Cart System are suggested to enhance waste container handling safety.

A Gantry Crane is suggested in lieu of a Bridge Crane to minimize initial construction costs.

Shield wall is provided to protect NDA & NDE equipment from possible radiation by materials stored in the Transportation Bay. 12" CMU is suggested.

This drawing is intended solely to illustrate basic design concepts and criteria.

FIGURE 10

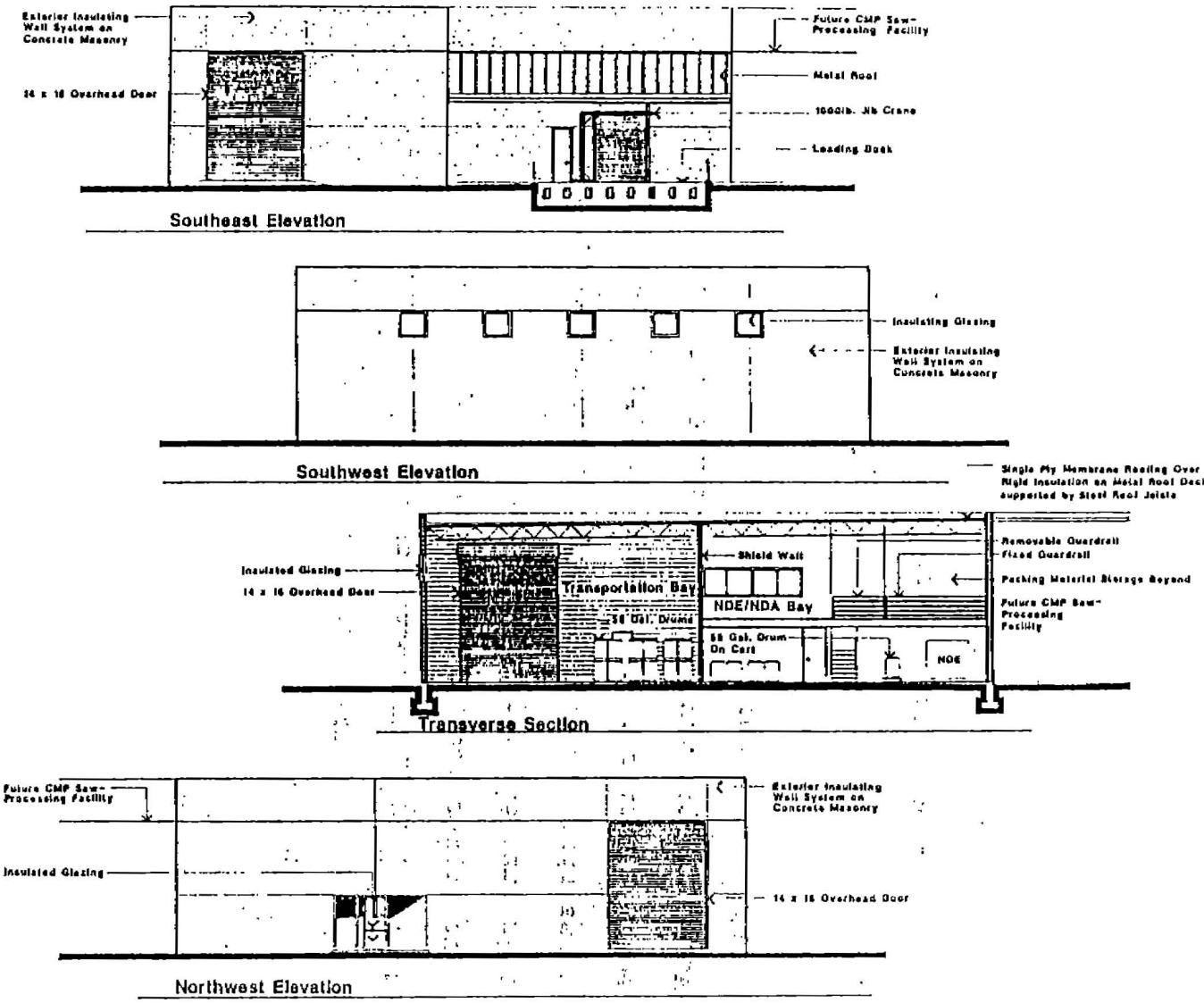
TRU WASTE NDA / NDE-TRANSPORTATION FACILITY

Los Alamos National Laboratory
Los Alamos New Mexico 87545

Lab Job No.: 7641-0 Date: 4-30-86

Holmes & Narver, Albuquerque, NM

H&N Job No.: 1644 20



ELEVATIONS and SECTION

This drawing is intended solely to illustrate basic design concepts and criteria.

0 4 8 16 24 32
Feet

FIGURE 11

TRU WASTE NDA / NDE-TRANSPORTATION FACILITY

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

Lab Job No.: 7641-0 Date: 4-30-0

Holmes & Narver, Albuquerque, NM
H&N Job No.: 1644.20

containers will pass through these facilities, no special ventilation or filtration equipment will be required except for the standard mechanical HVAC.

In the NDA-NDE Facility, the real-time x-ray radiography (RTR) and drum assay system may require some shielding from one another. This proposed facility will require approximately 301 m^2 (3240 ft^2) of ground floor area, including the loading dock area, with an approximate 112 m^2 (1200 ft^2) mezzanine.

The Transportation Facility will be 301 m^2 (3240 ft^2) in area, all of which will be a high bay (6.1 m (20 ft) clear floor to ceiling.) Two 4.3 m by 5.5 m (14 ft by 18 ft) doors at each end will allow drive-through of the TRUPACT transport vehicle. The TRUPACT will be filled, sealed, and tested inside of the Transportation Facility. Warehouse space for approximately six TRUPACT loads and for required dunnage will be provided.

The Holmes and Narver estimate for construction of the combined NDA-NDE/Transportation Facility is approximately $1075K (FY 86 dollars). This estimate is based upon a total direct construction cost of approximately $140/$ft^2$, including markups of approximately 6% for project management, 6% engineering; and 20% contingency.

5.1.3 CMP Saw

The CMP operations require a laboratory process-area facility with controlled ventilation, high efficiency

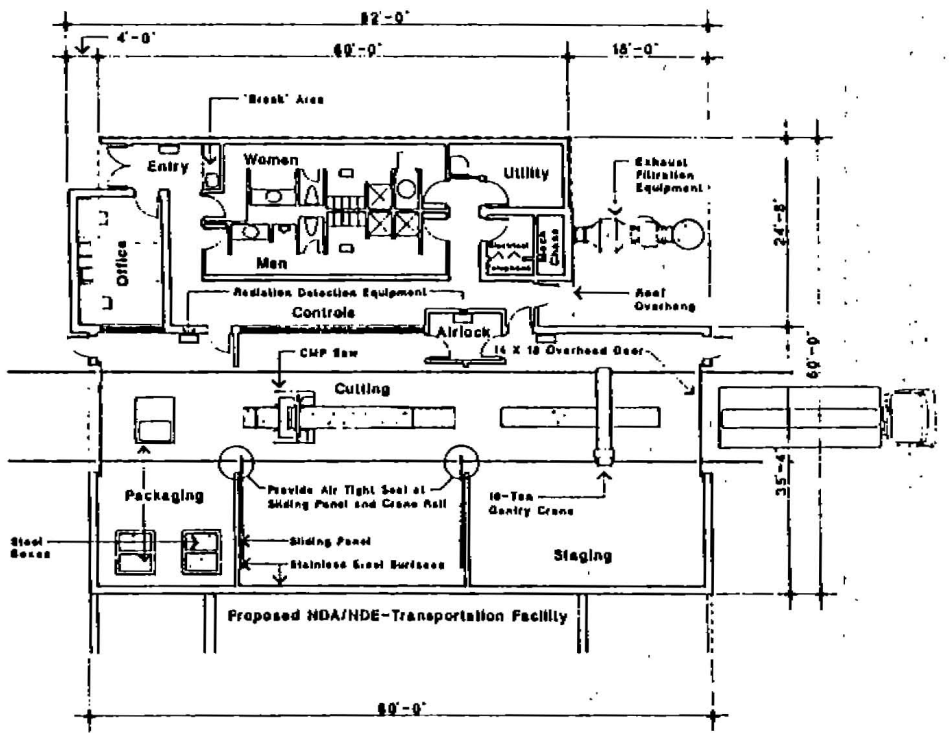
particulate air (HEPA)-filtered exhaust, and a contaminated waste-water collection system. A draft Engineering Study, prepared by Holmes and Narver, has been completed for this facility.

For the CMP Saw Facility, a processing and waste handling area of approximately 240 m^2 (2592 ft^2) and an associated personnel support area of approximately 123 m^2 (1328 ft^2), are to be provided (see Figures 12 and 13). Per current design plans, this facility will share a common wall with the Transportation Facility, but otherwise will be a totally independent building. Basic building construction again will be concrete masonry.

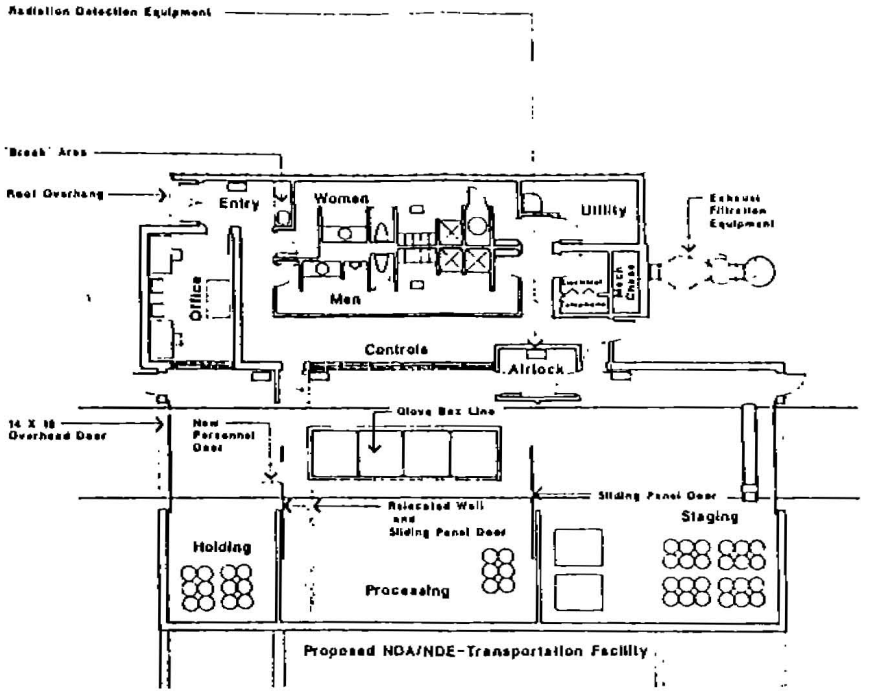
The Holmes and Narver estimate for construction of the CMP Saw Facility is approximately $962K (FY 86 dollars). This estimate is based upon a total direct construction cost of approximately $245/$ft^2$, including markups of approximately 6% for project management, 6% for Standard Engineering and Design, and 30% for contingency.

5.1.4 Processing

Following the campaign to cut all of the 158 TRU CMPs during FY 91, the CMP Saw Facility will be decontaminated to provide the capability to process, primarily immobilize, a variety of TRU waste streams which are anticipated to contain particulates. The conversion of the CMP Saw to the Processing Facility will be accomplished during FY 92



CMP SAW CUTTING CONFIGURATION



FUTURE PROCESSING CONFIGURATION

FLOOR PLANS

North

0 4 8 16 24 32

Feet

NOTES

A Gantry Crane is suggested in lieu of a Bridge Crane to minimize initial construction costs.

A complete air tight seal of the Cutting Room is required to control radiation contamination

This drawing is intended solely to illustrate basic design concepts and criteria.

FIGURE 12

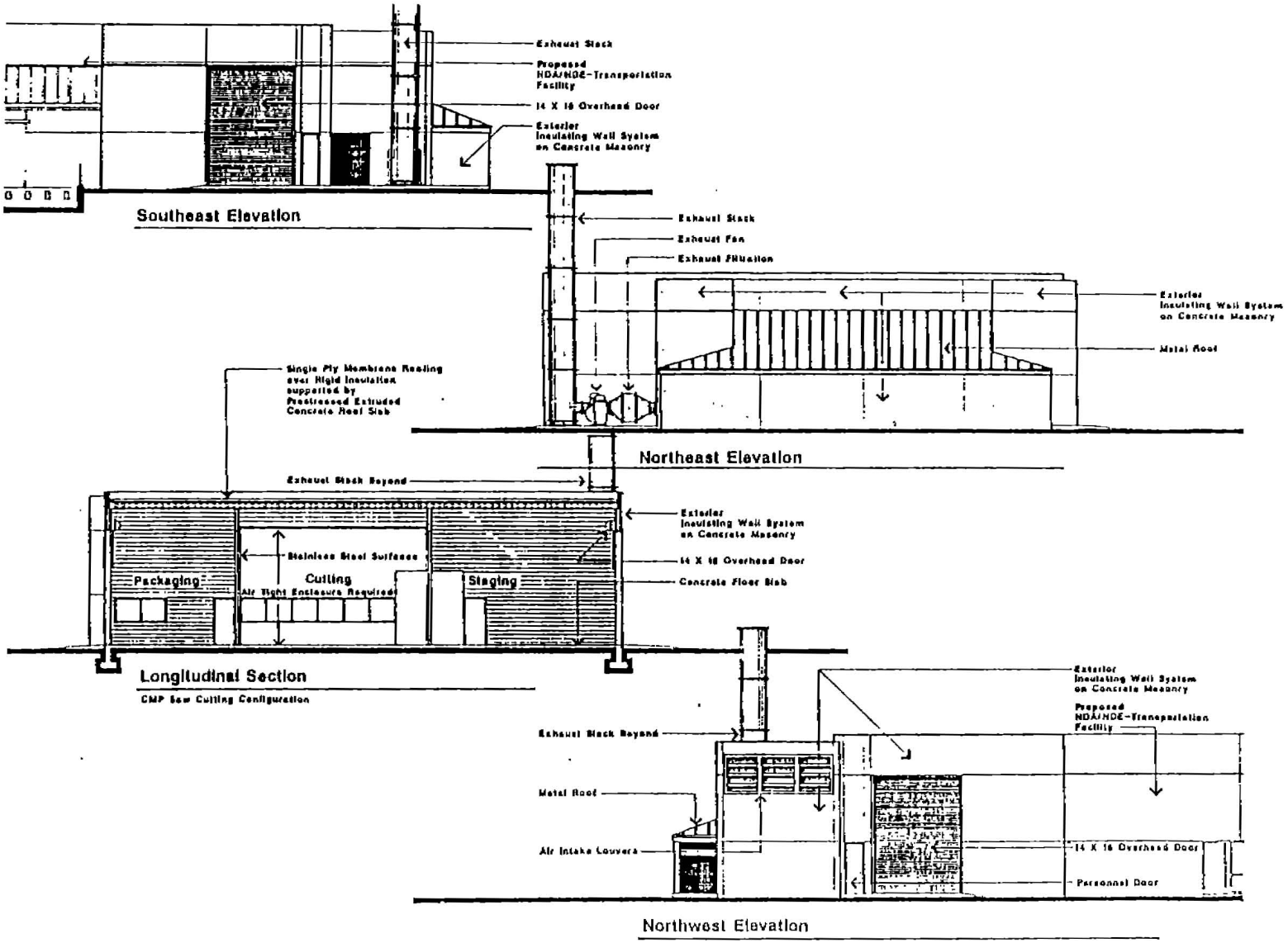
TRU WASTE CMP SAW - PROCESSING FACILITY

Los Alamos Los Alamos National Laboratory
Los Alamos New Mexico 87545

Lab Job No.: 7541-0 Date: 4-30-86

Holmes & Narver, Albuquerque, NM

H&N Job No.: 1644.20



ELEVATIONS and SECTION

1/16

0 4 8 16 24 32

Feet

This drawing is intended solely to illustrate basic design concepts and criteria.

FIGURE 13

TRU WASTE CMP SAW – PROCESSING FACILITY

Los Alamos Los Alamos National Laboratory Los Alamos New Mexico 87

Lab Job No.: 7641-0 Date: 4-30-

Holmes & Narver, Albuquerque, NM

H&N Job No.: 1644.20

utilizing FY 91 allocated Waste Management (IWO) GPP funding. The conversion project will involve only the processing and waste handling areas of the facility; the personnel support areas will remain unchanged. Conversion to provide appropriate facility space for processing operations will involve decontamination and disposal of CMP cutting equipment followed by facility modifications of interior room areas, liquid waste collection system, and ventilation systems. Appropriate processing equipment subsequently will be installed.

The Holmes and Narver estimate for construction modifications is approximately $430K (FY 86 dollars). A 25% contingency is included.

5.2 Capital Equipment

Capital equipment costs associated with each facility also are shown in Table 14. Unlike the construction funding requirements shown, however, we plan to obtain the capital equipment funding according to a more levelized schedule. The acquisition of the various items of capital equipment for the several facilities, therefore, is not specific to the year a particular facility is being built or even funded. There is a considerable time overlap on the purchase of much of the equipment as some may be essentially off-the-shelf items while other items may require lead-times of as long as two years for design, construction, checkout,

and/or training. The drum assay system and the CMP saw are typical examples of long lead-time items.

5.2.1 NDA-NDE

The primary equipment items are the active-passive nuclear materials assay system and a RTR system. The total capital equipment funding requirement identified for NDA-NDE is $1275K. Note that included in this cost is the waste drum integrity verification system that actually will be operated in the Waste Preparation Facility.

Arrangements currently are being completed with the Los Alamos Advanced Nuclear Technology (Q-2) Group for fabrication of a state-of-the-art active-passive drum assay system. Total estimated cost of this system, including design, fabrication, testing, calibration, and training is approximately $600K, of which approximately $417K is being allocated in FY 86. System delivery is scheduled for September 1987, with actual operation scheduled to begin in the fourth quarter of FY 88.

The second major equipment item is the RTR system. This system, again designed for 210 L (55 gal.) drums, will be purchased during FY 87 with operation again scheduled to begin during the fourth quarter of FY 88. The estimated cost of a 280 KeV system is $350K.

The third major item will be the waste drum integrity system. Current plans are to fabricate a system similar in

operation to that developed for use in Stored Waste Experimental Pilot Plant (SWEPP) at Idaho National Engineering Laboratory (INEL), although some effort to "simplify" operations are intended. The current estimated cost is $250K.

The balance of the capital equipment funding identified for the NDA-NDE operations include such smaller items as a forklift, jib crane, and related waste handling and personnel safety equipment items. The DOE-required bar coding equipment also is included. All equipment acquisition is scheduled to be complete by early FY 88 so that operations can begin in the fourth quarter of FY 88.

5.2.2 Transportation

A total capital equipment funding need of $285K is identified . A major item identified is a large capacity - 9090 kg (10 ton) - gantry crane. The current estimated cost of this item is $80K. A second major item is a portable truck scale. This unit, estimated to cost $85K, is required to assure maximum TRUPACT loading efficiency. Other items will include a forklift, other waste package handling items, equipment associated with TRUPACT loading and preparation requirements, and items associated with personnel and transportation safety.

5.2.3 CMP Saw

By far the major equipment item to be required will be the actual CMP cutting device. While the specific cutting

equipment has not yet been identified, a cost estimate of $250K assumes this to be a diamond reciprocating or band saw. Other items including a gantry crane, associated waste handling items, and personnel safety equipment result in a total estimate of $380K for this facility.

5.2.4 Processing

Drums containing a variety of TRU waste forms suspected of requiring immobilization will be brought to the Processing Facility where each drum will be introduced into a glove box containment system. Here, the drums will be opened and the contents sorted with certifiable items simply being repackaged. Nonacceptable items, anticipated primarily to be small inner packages containing such wastes as filter cakes, leached residues, evaporator salt bottoms, etc., will be shredded and subsequently mixed with cement for immobilizing the waste form. The cemented product will be packaged in drums.

The primary equipment items identified for this operation include the sorting and processing glove boxes, the small shredder, the cement-waste mixing/immobilization system, and associated waste handling equipment items. Again, detailed cost estimates for these items are not available at this time. The total estimated equipment cost for the facility is $1180K (FY 86 dollars).

5.3 Facility Operations

Operations and processing required for the Inventory Work-Off task include activities at the SRF, TDF, TRU Waste Preparation Facility, the NDA-NDE Facility, CMP Saw Facility, TRU Waste Processing Facility, and TRU Waste Transportation Facility. Other activities ancillary to operations of these facilities include removal of the drums and Fiberglas-Reinforced polyester (FRP)-coated crates from the storage berms, Research & Development (R&D), on and off-site transportation, and construction project/operations management and coordination. These projected operating costs through FY 97 are shown in Table 15.

Staffing required to meet the needs of the work-off program are outlined as follows:

Operation	Personnel Requirements
Size Reduction	0.5 staff
	3 operating technicians
	1 Health Physics technician
Incineration	0.5 staff (equivalent)
	1 technician (equivalent)
Retrieval/Preparation	2 operating technicians
NDA-NDE	0.5 staff
	2.5 operating technicians
	0.5 Health Physics technician
CMP Saw/Processing	1 staff
	3 operating technicians
	1 Health Physics technician

OPERATING COSTS
CH-TRU Waste
All costs beyond FY 86 in FY 86 dollars

($K)
FISCAL YEAR

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Retrieval/ Prep		10	10	14	60	160	160	160	160	160	160	160	160	160
NDA-NDE Facil					200	260	260	260	260	260	260	260	260	260
Trans Facil									252	252	252	252	252	252
CMP Facil							100	375	100	-	-	-	-	-
Proces Facil					160				275	375	375	375	375	375
Incin-erator					70	140	140	140	140	140	140	140	140	140
SRF	250	265	300	300	300	300	300	300	300	300	300	300	300	300
On-Site Trans	5	5	40	10	10	15	15	25	20	20	20	20	20	20
Proj Mgmt	120	125	300	265	132	132	132	132	132	132	132	132	132	132
TOTALS	375	405	650	589	932	1007	1107	1392	1639	1639	1639	1639	1639	1639

TABLE 15

	1 Health Physics technician
Transportation	0.5 staff
	2.5 operating technicians
	0.5 Health Physics technician
Construction/Operations	1 staff
Management	1 secretary/data analyst

5.3.1 Size Reduction

The current staff at the SRF is one staff member and two technicians. In late FY 86, when operations are restarted, the staffing will be changed to 0.5 staff and three technicians. The SRF will be processing, on the average, 80% work-off inventory wastes and 20% newly generated wastes. Operation costs attributable to inventory work-off will be $340K per year (FY 86 dollars).

5.3.2 Incineration

Los Alamos proposes that the research CAI in the TDF operate in a production mode to incinerate combustibles from the Inventory Work-Off Program beginning in FY 88. A once-a-year, approximate two-week operating campaign mode is proposed beginning in FY 88. An additional two weeks (minimum) is to be allowed for preparation, ash-removal and postrun cleanup and maintenance. This campaign mode will require round-the-clock and weekend operation, so attendant overtime pay will be needed for the technicians assigned to the run.

5.3.3 Preparation

Exhumation operations of FRP-coated crates at TA-54 began in FY 85. Initial retrieval operations of the cemented sludge CMPs at the TA-21 storage site, with transport to TA-54 and temporary re-storage, are expected to begin and be completed in FY 86.

Through mid-FY 88, the only exhumation will be of FRP-coated crates containing decommissioned equipment. This phase of the exhumation effort is in conjunction with the operations scheduled for the SRF.

This work will be periodic and will require rigger-equipment crew and laborers supplied by the support contractor company, along with a Waste Operations Section technician as task supervisor.

5.3.4 NDA-NDE

The NDA-NDE will begin operations in the fourth quarter of FY 88 with a personnel requirement of 0.5 staff member and 2.5 technicians. Initial operations will involve certification of wastes as well as screening of combustibles intended for incineration.

Operating personnel for NDA-NDE will be hired in early FY 88 to allow time for training and verification of successful operations.

5.3.5 CMP Saw

The CMP Saw Facility will commence actual operations in FY 91, and will operate for approximately one year, although

operations could extend into the first quarter of FY 92. These personnel will be hired during FY 90 to allow time for training and trial cold operations. Operations personnel will include 0.5 staff, 3 operating technicians, and a full-time health physics technician for support.

5.3.6 Processing

The TRU Waste Processing Facility is due to come on line in FY 93. However, an FY 88 R&D effort is required to determine the acceptable processing method or methods for the wastes that originated in the Plutonium Facility process lines. The resultant processes will be incorporated in the design and construction of this facility.

Operational requirements, beginning in FY 93, include 0.5 staff member, three operating technicians, and one health physics technician. These will be the same operating personnel as those operating the CMP Saw Facility (above). These personnel will be actively involved in the installation and testing of processing equipment during the FY 92 transformation to the Processing Facility.

5.3.7 TRU-Waste Transportation Facility

Shipments of newly generated (NG) wastes to the WIPP are scheduled to begin in FY 89. For these operations it is assumed that the TRU-Waste Transportation Facility personnel requirements will be funded by programs generating the waste. This operation will continue until FY 92 when work-

off and precertified wastes begin to be shipped. At that time, personnel requirements for handling the 100 TRUPACTs per year will be 0.5 staff and 2.5 technicians. The operating cost estimated in Table 15 represents the approximate portion of the total Transportation Facility cost associated with stored wastes; programs providing NG wastes (it is assumed) will continue to fund the handling and shipment of their wastes. Per current estimates, 60% of the waste shipped in FY 92 and beyond will be work-off and stored, precertified wastes while 40% will be NG wastes. Included in this estimate is $120K for actual shipping costs.

Operations of the Transportation Facility will continue beyond FY 97 to be funded in part by the work-off project. This funding will continue through FY 02 when all of the stored wastes have been shipped. At that time only NG wastes will continue to be shipped with funding for the operations provided by the generator programs. Based upon continuation of shipping 100 TRUPACTs per year until all stored wastes have been shipped, the cost to the work-off program will continue at $252K per year (FY 86 dollars) for the period FY 98 through FY 02.

5.3.8 Construction/Operations Management

The Waste Management Group has taken advantage of the services of one of the large captive architectural

engineering firms available to Los Alamos. Holmes and Narver, Inc. was contracted to study in detail our proposed waste work-off operations and make appropriate recommendations, and to develop the necessary Engineering Studies and/or Design Criteria. The Laboratory's Engineering Division will develop the Title I and II documents and/or drawings. The related AE and Engineering Division costs have been included in the FY 84 through FY 87 cost figures and tables in this IWOP.

As the Laboratory moves into Title III in mid-FY 86 on the first of the work-off facilities, the TRU Waste Preparation Facility, it will require the full time services of one staff member with the support of one full time secretary/data analyst for construction and operations management. The services will be required throughout the work-off period. These individuals initially will be responsible for overseeing the construction of the several work-off facilities and the procurement of all the equipment, both capital and expense, tools, and supplies necessary to bring the work-off facilities on line. Subsequently, they will be involved in an operations management capacity.

5.4 Cost Summary for CH-TRU Work Off

Resource requirements identified in this plan total $3800K capital construction, $3120K capital equipment and $16 291K

operating (through FY 97). Handling and shipping costs during the period FY 98 through FY 02 will add an estimated $1260K (FY 86 dollars) to this operating cost for stored waste work-off, resulting in an overall total operating cost for work-off of $24 471K (all values in year-of-expenditure or FY 86 dollars as appropriate.) Table 16 provides an overall summary of the anticipated cost associated with CH-TRU work-off at Los Alamos.

5.5 Remote-Handled TRU Wastes

As discussed in some detail in Section 4.5 of this IWOP, there are several options available to Los Alamos for preparation and certification of our remote handled (RH)-TRU wastes for the WIPP. Our particular strategy is, therefore, currently undefined. However, our preferred option at this time is to proceed with certification and work-off operations in association with the currently planned decontamination of the TRU hot cells begining in FY 87.

To accomplish this task, funding proposals have been prepared and submitted to Defense TRU Waste Programs and IWO. These requests totaled $765K, originally identified for the two years, FY 87 and 88. The currently proposed extension of this effort through FY 90 is not expected to significantly increase this estimated cost. This cost is broken down by FY as follows:

FY 87	FY 88-90
$150K Operations	$300K Operations
$165K Equipment	$150K Equipment

According to this plan, beginning in FY 87 the prototype welder would be procured and required design modifications initiated to utilize this system with the approved 3 m (10 ft) RH canister. The welder would also be used for operations within the shielded corridor of the Los Alamos TRU hot cell facility.

Approximately 15 RH-TRU waste canisters would initially be obtained from an approved vendor. Upon receipt, a minimum of one of these canisters would be expended for system demonstration purposes. Demonstration is anticipated to include all possible aspects of canister filling, sealing, testing, and on-site handling.

Concurrent with the above tasks, procedures and certification documentation would be modified or prepared, as required, for full certification of the completed RH-TRU canisters. A certification plan and attachment addressing certification of routinely generated RH-TRU waste forms is being completed, approved and implemented during FY 86. New approved documentation specifically would be required for the RH canister sealing and handling.

Following successful completion of these above tasks, work should proceed with the actual loading of canisters with certified RH-TRU wastes being generated in the TRU hot cell decontamination project. We would plan to have RH-TRU waste generated from facility decontamination stored in the hot cells awaiting packaging in the canister. The first canisters would be

sealed, tested, and transported to the TA-54, Area G, radioactive waste management site for interim storage while awaiting the availability of the defense high level waste cask for shipment to the WIPP.

Capital equipment funding in FY 87 would be utilized specifically for effecting the required modifications to the canister welding system, and for acquisition of the canisters.

Through FY 90, RH-TRU wastes generated through the on-going decontamination of TRU hot cells would continue to be certified and packaged for WIPP in RH canisters. Additional canisters would be obtained as determined by projected waste volumes.

In addition, retrieval would begin of readily certifiable RH-TRU wastes that have been accumulated in interim storage. These wastes currently are stored in small, approximately 8 L (2 gal.) size welded containers that, in turn, are stored in a removable manner inside of sections of pipe. Both the small waste packages and filled pipe sections are fully compatible with packaging in the RH canister. These wastes would be brought to the hot cell facility, certified by NDA-NDE means, and prepared in the WIPP canister. A requirement for completing this work will be the availability on loan of the portable NDA-NDE system currently being developed.

By the end of FY 90, all readily certifiable RH-TRU waste would be certified and prepared for shipment to WIPP. No further RH-TRU waste is anticipated to be generated. Some older RH-TRU

wastes that were sealed in larger steel/concrete casks at a future time will be handled as "special case" wastes; there currently appears to be no available, practical means of certifying these wastes. Capital equipment funding beyond FY 87 would be primarily for acquisitions of additional RH-TRU canisters. If the certification of the Los Alamos RH-TRU wastes is delayed until after FY 97, it is estimated the total cost will increase substantially for later retrieval, certification, and packaging. This increase is due mostly to the loss of adequate facilities in which to handle and package the RH-TRU wastes, thus requiring the construction of temporary, limited-use facilities. The certification and shipping could not be completed until FY 07.

5.6 Special Case TRU Wastes

As mentioned earlier in this IWOP, the volumes of special case (SC)-TRU wastes are small, and these wastes cannot reasonably meet the criteria for certification. Only one option is realistic for adequate and safe disposal of Los Alamos SC-TRU wastes, and that is greater confinement disposal (GCD) burial at the Los Alamos TA-54 Disposal Site.

As these volumes are small, and by the nature of many of the items, the entire inventory of SC-TRU waste can be evaluated, approved, and consolidated in a (GCD) deep pit disposal site for an estimated $300K (FY 86 dollars). This effort likely could be completed in FY 98.

Total of Projected Costs associated with CH-TRU Waste Work-Off.

(All Values $K)

Cost/FY	FY 84	FY 85	FY 86	FY 87		FY 88		FY 89		FY 90		FY 91		FY 92		FY 93-97		FY 98-02	
				FY 86$	YOE$	FY 86$	YOE$	FY 86$	YOE$	FY 86	YOE$	FY 86	YOE$	FY 86	YOE$	FY 86	YOE$	FY 86	YOE$
Operating	380	412	482	456	480	932	1030	1007	1165	1107	1345	1392	1775	1639	2195	1639	2310 to 2800	252	455 to 553
Capital Equipment	--	--	500	500	525	600	660	420	490	420	510	420	535	260	350	--	--	--	--
GPP	500	300	570[2]	925[2]	970[2]	1075[2]	1200[2]	--	--	--	--	--	--	430	575	--	--	--	--

Notes:

1. Year of expenditure dollars (YOE$) calculated based upon an approximate 5% per year inflation.

2. Values shown are funding actually received or requested in these FYs, with the total for the three years providing for completion of the overall facilities.

TABLE 16

6.0 Public Documentation Requirements

The overall Los Alamos National Laboratory (Los Alamos) work-off effort requires modifications to two existing facilities and construction of five new facilities, as described in previous sections. These projects and the planned work-off activities have required the preparation of a single Action Description Memorandum (ADM). The DOE routinely requires an ADM for a proposed project. The operations planned for work-off in these facilities are not considered new or unique to Los Alamos, and consequently, should fall under the "umbrella" of the existing Los Alamos National Laboratory Final Environmental Impact Statement (EIS). The Department of Energy (DOE) is requiring all facilities which will transport transuranic (TRU) waste to the Waste Isolation Pilot Project (WIPP) to prepare an Environmental Assessment (EA). The EA is currently in preparation.

6.1 Action Description Memorandum

Preparation of the ADM was completed and the document approved by the Laboratory on September 17, 1985. The DOE is currently reviewing the ADM. The proposed action is implementation of the Los Alamos Inventory Work-Off Plan (IWOP) (i.e., retrieving, processing, and placement in the WIPP located in southern New Mexico). Potential impacts resulting from implementation of this IWOP will be addressed in the Los Alamos Work-Off EA, a draft of which is being prepared during Fiscal Year (FY) 86. The ADM addressed environmental issues associated with

the proposed action. In addition, the ADM identified those health and safety documents that are required by the DOE.

6.2 Environmental Assessment

The only other public documentation currently identified by the DOE as necessary to cover the IWOP activities and facilities is an EA. The EA, a concise public document, will aid in determining whether preparation of an EIS is necessary, provide a way for an agency to show compliance with the National Environmental Policy Act (NEPA), and facilitate the preparation of an EIS if one is necessary.

The EA will address, but will not be limited to, the following environmental concerns:

- Archaeology
- Floodplain/Wetlands
- Threatened and Endangered Species
- Construction
- Potential Hazards and Impacts of Possible Accidents (including on-site and off-site transportation risks)
- Impacts from Routine Emissions and Effluents
- Site Restoration after Decommissioning

The Laboratory is funded to $130K (FY 86 $80K; FY 87 $50K) for the effort on the EA. A draft of the EA will be completed by the Laboratory by September 1, 1986, and submitted to DOE-Albuquerque Operations Office (ALO) and DOE-headquarters (HQ) for their review.

6.3 Supporting Documents

Los Alamos has identified numerous related or supporting documents to the ADM and EA. These documents involve design, strategy, safety, or are schedule related. It is beyond the scope of this IWOP to discuss these documents in detail at this time. Programatic changes may cause revision of, or even cancel, the nature of some of these supporting documents in part or in whole, and may also change anticipated completion dates. These supporting documents are shown in Table 17.

TRU WASTE WORK-OFF DOCUMENTATION

TABLE 17

	Completion Date
1. Certification Documents	
1.1. TRU Waste Certification Plan	3rd Qt, FY 85*
1.1.1 Attachment 1 (SRF)	3rd Qt, FY 85*
1.1.2 Attachment 2 (Liquid Waste)	3rd Qt, FY 86*
1.1.3 Attachment 3 (MST-Div)	3rd Qt, FY 86*
1.1.4 Attachment 4 (CHM-1)	4th Qt, FY 86
1.1.5 Attachment 6 (MST-Div Process)	4th Qt, FY 86
1.1.6 Attachment 7 (MST-14)	4th Qt, FY 86
1.1.7 Attachment 9 (Pu-238)	4th Qt, FY 86
1.1.8 Attachment 10 (Toxicology)	TBD
1.2 Certification Plan for Stored Waste Work-Off	2nd Qt, FY 88
1.2.1 Attachment 1 (NDA NDE)	2nd Qt, FY 88
1.2.2 Attachment 2 (CMP Saw)	3rd Qt, FY 90
1.2.3 Attachment 3 (Process)	1st Qt, FY 93
2. Design and Planning Documents	
2.1 H & N, TRU Waste Preparation Facility (Design Criteria, Title II)	2nd Qt, FY 86*
2.2 H & N, TRU Waste Site Improvement, TA-54 (Engineering Study)	3rd Qt, FY 86*
2.3 H & N, TRU Waste NDA-NDE Facility/ transportation Facility (Design Criteria)	3rd Qt, FY 86*
2.4 H & N, TRU Waste CMP-Saw Facility/ Processing Facility (Engineering Assessment)	3rd Qt, FY 86*
3. Strategy Documents	
3.1 Waste Management Site Plan	2nd Qt, FY 86*
3.2 Inventory Work-Off Plan (IWOP)	4th Qt, FY 86*
4. Environmental Documents	
4.1 Action Description Memorandum TRU Waste Work-Off Facilities	4th Qt, FY 85*
4.2 Environmental Assessment TRU Waste Work-Off Facilities	4th Qt, FY 86

TABLE 17 (Cont.)

4.3	Los Alamos National Laboratory Final Environmental Impact Statement	2nd Qt, FY 79*
5.	Safety Documentation	
5.1	Safety Assessment TRU Waste Preparation Facility	1st Qt, FY 87
5.2	Safety Assessment TRU Waste NDA-NDE Facility	3rd Qt, FY 88
5.3	Safety Assessment TRU Waste Transportation Facility	3rd Qt, FY 88
5.4	Preliminary Safety Analysis Report TRU Waste CMP Saw Facility	4th Qt, FY 88
5.5	Preliminary Safety Analysis Report TRU Waste Processing Facility	4th Qt, FY 91
5.6	Final Safety Analysis Report Size Reduction Facility	4th Qt, FY 86*
5.7	Final Safety Analysis Report TRU Waste CMP Saw Facility	1st Qt, FY 91
5.8	Final Safety Analysis Report TRU Waste Processing Facility	1st Qt, FY 93
5.9	Final Safety Analysis Report Transuranic Contaminated Solid Waste Treatment and Development Facility	4th Qt, FY 79* Addendum: 3rd Qt, FY 81* Further Addendum TBD

* = Completed

APPENDIX A

Characteristics of Los Alamos Stored TRU Wastes through CY 85

LOS ALAMOS NATIONAL LABORATORY TRU WASTES IN STORAGE THROUGH CY 1985

Waste Code & Descrip.	Type of Package	No. of Pkgs	Volume (m^3)	Weight (kg)	Pu-239 (g)	Pu-238 (g)	Am-241 (g)	U-233 (g)	Other (g)	MFP/AP (Ci)	TRU Total Curies	TRU Alpha Curies	MAX mr Surf	AVE mr Surf	0-10 mr/hr	>10-100 mr/hr	>100 mr/hr
A10 Graphite	30-gal																
	55-gal	6	1.2	387.5	73.1						33.5	5.2	11.0	4.2	6		
	Casks[a]																
	Crates																
	Other																
	Subtotal	6	1.2	387.5	73.1						33.5	5.2			6	0	0
A14 Combust. Room Decon Waste	30-gal																
	55-gal	382	76.4	20344.1	138.5	0.7					95.5	20.8	19.0	1.7	380	2	
	Casks[a]																
	Crates																
	Other																
	Subtotal	382	76.4	20344.1	138.5	0.7					95.5	20.8			380	2	0
A15 Mixed Cellulosic	30-gal	124	12.5	3839.3	99.3	1.0					61.1	24.4	4.0	1.1	124		
	55-gal	224	44.5	11810.9	757.0	17.0					812.7	342.5	18.0	3.1	223	1	
	Casks[a]	22	11.1	574.4		240.8					3923.5	3855.7	12.0	0.5	21	1	
	Crates																
	Other																
	Subtotal	370	68.1	16224.6	856.3	258.8					4797.3	4222.6			368	2	0
A16 Plastic Materials	30-gal	9	1.0	342.1	21.6						9.8	1.5	1.0	0.1	9		
	55-gal	392	78.4	21272.7	12598.8	55.7			51.0[b]		11420.7	1709.1	186.0	10.6	289	100	3
	Casks[a]	7	3.2	208.7		115.0					1973.9	1967.1	5.0	1.5	7		
	Crates																
	Other																
	Subtotal	408	82.6	21823.5	12620.4	170.7			51.0		13404.4	3677.7			305	100	3

Notes: a Concrete casks each containing 2 30-gal drums. Data provided (number of packages, weight, etc.) is for the drums themselves, except that the volume listed the gross volume of the casks.

b U-20

LOS ALAMOS NATIONAL LABORATORY TRU WASTES IN STORAGE THROUGH CY 1985

Waste Code & Descrip.	Type of Package	No. of Pkgs	Volume (m^3)	Weight (kg)	Pu-239 (g)	Pu-238 (g)	Am-241 (g)	U-233 (g)	Other (g)	MFP/AP (Ci)	TRU Total Curies	TRU Alpha Curies	MAX mr Surf	AVE mr Surf	0-10 mr/hr	>10-100 mr/hr	>100 mr/hr
A17 Rubber Materials	30-gal																
	55-gal	21	4.2	1192.3	454.1	9.0					383.1	157.4	10.0	2.3	21		
	Casks[a]	38	19.9	1654.7		140.1					2382.1	2367.9	15.0	2.5	37	1	
	Crates																
	Other																
	Subtotal	59	24.1	2847.0	454.1	149.1					2765.2	2525.3			58	1	0
A18 Mixed Paper, Rubber, Plastic	30-gal	9	1.0	248.9	13.6						6.2	0.9	10.0	1.1	9		
	55-gal	1211	243.1	63015.0	7257.9	173.3	0.015	3.4	11.0[c]	0.004	9411.8	3061.2	120.0	4.5	1141	68	2
	Casks[a]	102	54.0	3572.1		631.1					10795.2	10747.8	19.0	7.5	98	4	
	Crates																
	Other																
	Subtotal	1322	298.1	66836.0	7271.5	804.4	0.015	3.4	11.0	0.004	20213.2	13809.9			1248	72	2
A19 Mixed Combust./ Noncombust Trash	30-gal	38	4.3	1259.8	82.8						36.0	5.9	5.0	0.2	38		
	55-gal	899	180.7	51245.1	3792.6	72.3	1.4	0.01	41.8[d]	0.001	3424.1	1360.7	180.0	3.2	872	19	8
	Casks[a]	106	52.3	3335.9		1436.6					24655.9	24569.1	33.0	3.8	102	4	
	Crates	15	48.4	3457.6	12.7						23.7	1.0	3.0	0.2	15		
	Other																
	Subtotal	1058	285.7	59298.4	3888.1	1508.9	1.4	0.01	41.8	0.001	28139.7	25936.7			1027	23	8
A20 Hydrocarbon Oil	30-gal																
	55-gal	15	3.0	1905.3	3.2						3.0	0.3	13.0	2.4	14	1	
	Casks[a]																
	Crates																
	Other																
	Subtotal	15	3.0	1905.3	3.2						3.0	0.3			14	1	0

Notes: c U-20
d U-238 24.0, Cm-244 0.8, U-20 17.0 grams.

LOS ALAMOS NATIONAL LABORATORY TRU WASTES IN STORAGE THROUGH CY 1985

Waste Code & Descrip.	Type of Package	No. of Pkgs	Volume (m^3)	Weight (kg)	Pu-239 (g)	Pu-238 (g)	Am-241 (g)	U-233 (g)	Other (g)	MFP/AP (Ci)	TRU Total Curies	TRU Alpha Curies	MAX mr Surf	AVE mr Surf	0-10 mr/hr	>10-100 mr/hr	>100 mr/hr
A21 Silicon Oil	30-gal	1	0.1	124.0							0.1	0.1	1.0	1.0	1		
	55-gal	5	1.0	809.8	25.7						4.1	1.6	5.0	1.6	5		
	Casks[a]																
	Crates																
	Other																
	Subtotal	6	1.1	933.8	25.7						4.2	1.7			6	0	0
A25 Leached Process Residues	30-gal	232	25.9	9708.7	6778.0	0.3					3012.2	485.5	45.0	1.1	226	6	
	55-gal	1266	263.3	191684.8	83068.1	10.9	139.2		507255.2[e]		62490.7	6834.3	120.0	3.6	1135	128	3
	Casks[a]	14	5.6	370.3	3.0	129.8					1897.8	1804.4	18.0	7.9	9	5	
	Crates																
	Other																
	Subtotal	1512	294.8	66836.0	89849.1	804.4	139.2		507255.2		67400.7	9124.2			1370	139	3
A26 Evaporator Bottoms	30-gal																
	55-gal	358	71.6	85521.0	14953.8		0.01		503123.7[f]		11593.1	1100.3	100.0	3.2	346	12	0
	Casks[a]																
	Crates																
	Other																
	Subtotal	358	71.6	85521.0	14953.8		0.01		503123.7		11593.1	1100.3			346	12	0
A27 Nitrate Salts	30-gal																
	55-gal	194	38.8	38252.3	16229.9				72411.0[g]		8989.3	1171.2	190.0	5.3	175	16	3
	Casks[a]																
	Crates																
	Other																
	Subtotal	194	38.8	38252.3	16229.9				72411.0		8989.3	1171.2			175	16	3

Notes: e Th-232 21000.0, U-235 1500.0, U-10 428343.4, U-20 78911.8 grams.
f U-12 287510.0, U-20 15613.7 grams
g U-12 65941.5, U-20 6466.8, U-238 2.7 grams.

LOS ALAMOS NATIONAL LABORATORY TRU WASTES IN STORAGE THROUGH CY 1985

Waste Code & Descrip.	Type of Package	No. of Pkgs	Volume (m^3)	Weight (kg)	Pu-239 (g)	Pu-238 (g)	Am-241 (g)	U-233 (g)	Other (g)	MFP/AP (Ci)	TRU Total Curies	TRU Alpha Curies	MAX mr Surf	AVE mr Surf	0-10 mr/hr	>10-100 mr/hr	>100 mr/hr
A28 Chloride Salts	30-gal 55-gal Casks[a] Crates Other	96	19.2	10059.1	16207.3						7486.6	1155.9	130.0	7.2	87	8	1
	Subtotal	96	19.2	10059.1	16207.3						7486.6	1155.9			87	8	1
A29 Hydroxide Cake	30-gal 55-gal Casks[a] Crates Other	2 1	0.4 0.4	277.6 40.3	40.0	36.0			38.0[h]		66.4 526.0	3.5 500.4	5.0 40.0	4.5 40.0	2	1	
	Subtotal	3	0.8	317.9	40.0	36.0			38.0		592.4	503.9			2	1	0
A30 PN Equipment	30-gal 55-gal Casks[a] Crates Other[j]	10 339 28 74 4	1.0 67.9 13.8 578.5 5.7	599.5 26710.4 1729.8 63095.4 3175.2	14.7 1061.1 1054.5 0.1	0.2 27.0 76.3 20.1			6.0[i] 0.4[k]	0.004 0.01	10.2 1173.7 1255.1 403.4 0.0	4.5 501.2 1236.6 386.8 0.0	2.0 44.0 5.0 70.0 110.0	0.8 1.8 2.7 4.5 27.5	10 338 28 72 3	1 2	1
	Subtotal	455	666.9	95310.3	2130.4	123.6			6.4	0.014	2842.4	2129.1			451	3	1
A31 Non-PN Equipment	30-gal 55-gal Casks[a] Crates Other[m]	4 7 182 13	0.8 3.8 1595.5 33.6	192.5 499.6 174228.6 13084.4	0.9 7372.1 73.4	24.0 139.2 1.0			14.0[l]	1.0	0.1 413.1 3088.9 47.9	0.1 412.0 2878.8 19.1	4.0 1.0 300.0 1.5	1.8 0.3 3.5 0.1	4 7 179 13	2	1
	Subtotal	206	1633.7	188005.1	7446.4	164.2			14.0	1.0	3550.0	3310.0			203	2	1

Notes: h U-38
i U-238
j Other: 1 80-gal and 3 99-gal drums.
k U-235
l U-235
m 2 extra large 3' x 6' drums, 8 standard WIPP boxes, 3 WIPP overpack boxes.

LOS ALAMOS NATIONAL LABORATORY TRU WASTES IN STORAGE THROUGH CY 1985

Waste Code & Descrip.	Type of Package	No. of Pkgs	Volume (m^3)	Weight (kg)	Pu-239 (g)	Pu-238 (g)	Am-241 (g)	U-233 (g)	Other (g)	MFP/AP (Ci)	TRU Total Curies	TRU Alpha Curies	MAX mr Surf	AVE mr Surf	0-10 mr/hr	>10-100 mr/hr	>100 mr/hr
A35 Combust. Building Debris	30-gal 55-gal Casks[a] Crates Other	2	7.2	517.0	8.8						16.8	0.7	0.0	0.0	2		
	Subtotal	2	7.2	517.0	8.8						16.8	0.7			2	0	0
A36 Noncomb. Building Debris	30-gal 55-gal Casks[a]	1	0.2	53.6	0.0						0.0	0.0	1.0	1.0	1		
	Crates	14	57.6	5917.0	351.0						175.9	25.7	3.0	1.8	14		
	Other[n]	1	2.1	1814.4	0.0						0.0	0.0	0.0	0.0	1		
	Subtotal	16	59.9	7785.0	351.0						175.9	25.7			16	0	0
A40 Combust. Hot-Cell Waste	30-gal 55-gal Casks[a] Crates Other	16	3.3	5380.0	2.2				9.2[o]	0.08	1.4	0.2	190.0	57.5	2	12	2
	Subtotal	16	3.3	5380.0	2.2				9.2	0.08	1.4	0.2			2	12	2
A41 Noncomb. Hot-Cell Waste	30-gal 55-gal Casks[a] Crates Other	22	4.6	7762.8	2.5	0.1			8.4[p]	0.8	1.9	1.9	195.0	113.2		9	13
	Subtotal	22	4.6	7762.8	2.5	0.1			8.4	0.8	1.9	1.9			0	9	13

Notes: n Other: 4' x 6' extra large drum.
o U-36 6.0, U-235 3.2 grams.
p U-235

LOS ALAMOS NATIONAL LABORATORY TRU WASTES IN STORAGE THROUGH CY 1985

Waste Code & Descrip.	Type of Package	No. of Pkgs	Volume (m^3)	Weight (kg)	Pu-239 (g)	Pu-238 (g)	Am-241 (g)	U-233 (g)	Other (g)	MFP/AP (Ci)	TRU Total Curies	TRU Alpha Curies	MAX mr Surf	AVE mr Surf	0-10 mr/hr	>10-100 mr/hr	>100 mr/hr
A46 Skull and Oxide	30-gal	1	0.1	48.0	9.4				9.0[q]		4.3	0.7	0.0	0.0	1		
	55-gal																
	Casks[a]																
	Crates																
	Other																
	Subtotal	1	0.1	48.0	9.4				9.0		4.3	0.7			1	0	0
A47 Slag and Porcelain Crucibles	30-gal																
	55-gal	685	137.0	58618.4	126854.9		6.1	1.0	10013.0[r]		66435.0	9119.3	130.0	6.4	594	90	1
	Casks[a]																
	Crates																
	Other																
	Subtotal	685	137.0	58618.4	126854.9		6.1	1.0	10013.0		66435.0	9119.3			594	90	1
A50 Metal Crucibles, Scrap, Dies	30-gal	45	4.5	2009.5	159.7	0.6					82.9	21.8	5.0	1.3	45		
	55-gal	142	28.4	9724.0	1233.2	21.6					1029.2	465.2	9.0	2.6	142		
	Casks[a]	6	3.4	199.6		132.5					2305.5	2305.5	0.0	0.0	6		
	Crates																
	Other																
	Subtotal	193	36.3	11933.1	1392.9	154.7					3417.6	2792.5			193	0	0
A51 Precious Metals	30-gal																
	55-gal	2	0.4	86.3	0.2						0.01	0.01	1.0	1.0	2		
	Casks[a]	1	0.4	47.9		6.6					96.4	91.7	2.0	2.0	1		
	Crates																
	Other																
	Subtotal	3	0.8	134.2	0.2	6.6					96.41	91.71			3	0	0

Notes: q U-235
r U-12 10000.0, U-20 13.0 grams.

LOS ALAMOS NATIONAL LABORATORY TRU WASTES IN STORAGE THROUGH CY 1985

Waste Code & Descrip.	Type of Package	No. of Pkgs	Volume (m^3)	Weight (kg)	Pu-239 (g)	Pu-238 (g)	Am-241 (g)	U-233 (g)	Other (g)	MFP/AP (Ci)	TRU Total Curies	TRU Alpha Curies	MAX mr Surf	AVE mr Surf	0-10 mr/hr	>10-100 mr/hr	>100 mr/hr
A52 Scrap Metal	30-gal	1	0.1	24.4	0.2						0.7	0.0	0.0	0.0	1		
	55-gal	718	143.6	53633.6	14919.2	27.5			9550.0[a]	0.02	11354.0	1479.0	110.0	2.8	686	30	2
	Casks[a]	76	38.9	3570.2	3.0	607.5					10345.6	10286.8	17.0	1.9	73		
	Crates	6	38.9	4171.6	136.5						58.2	9.9	0.0	0.0	6		
	Other[t]	7	14.0	33837.8	145.0						42.6	19.7	0.0	0.0	7		
	Subtotal	808	235.5	95237.6	15203.9	635.0			9550.0	0.02	21801.1	11795.4			773	30	2
A55 Filter Media	30-gal	1	0.1	21.3	0.6						0.2	0.0	0.0	0.0	1		
	55-gal	9	1.9	1487.4	3.3		0.02				2.9	0.3	2.0	0.8	9		
	Casks[a]	16	7.4	1573.5		113.5					1974.9	1974.9	0.0	0.0	16		
	Crates	47	155.6	14098.3	9.1	0.02					2.1	2.1	1.0	0.5	47		
	Other																
	Subtotal	73	165.0	17180.5	13.0	113.52	0.02				1980.1	1977.3			73	0	0
A56 Filter Media Residue	30-gal																
	55-gal	3	0.6	142.8	5.6						2.6	0.4	0.0	0.0	3		
	Casks[a]																
	Crates																
	Other																
	Subtotal	3	0.6	142.8	5.6						2.6	0.4			3	0	0
A60 Other Combust.	30-gal	2	0.2	65.2	10.7						4.9	0.8	0.0	0.0	2		
	55-gal	2248	450.7	124773.4	19028.8	64.6	6.2		15528.0[u]	0.03	24769.2	2383.0	160.0	3.3	2122	119	7
	Casks[a]	64	25.9	2143.3	43.0	409.7					6042.2	5744.1	40.0	7.3	50	14	
	Crates																
	Other																
	Subtotal	2314	476.8	126981.9	19082.5	474.3	6.2		15528.0	0.03	30816.3	8127.9			2174	133	7

Notes: a Cs-109 1.0, U-12 8000.0, U-20 1549.0 grams.
t 3 2'-diameter spheres and 4 6'-diameter spheres.
u U-235 423.0, U-12 12000.4, U-20 3102.6, Np-237 2.0 grams.

LOS ALAMOS NATIONAL LABORATORY TRU WASTES IN STORAGE THROUGH CY 1985

Waste Code & Descrip.	Type of Package	No. of Pkgs	Volume (m^3)	Weight (kg)	Pu-239 (g)	Pu-238 (g)	Am-241 (g)	U-233 (g)	Other (g)	MFP/AP (Ci)	TRU Total Curies	TRU Alpha Curies	MAX mr Surf	AVE mr Surf	0-10 mr/hr	>10-100 mr/hr	>100 mr/hr
A61 Other Noncombus.	30-gal	33	3.8	1182.0	32.9						15.4	2.8	100.0	10.5	28	5	
	55-gal	1797	361.2	125318.6	38724.4	115.6	13.2	9.0	92410.0[v]	0.02	35444.4	4678.3	250.0	5.3	1694	100	3
	Casks[a]	226	97.1	8370.1	250.0	2441.2		4302.0			3829.8	36924.5	250.0	4.0	181	39	6
	Crates	5	5.7	2400.0	261.0						118.5	18.6	1.0	0.9	5		
	Other																
	Subtotal	2061	467.8	137270.7	39268.3	2556.8	13.2	4311.0	92410.0	0.02	73708.1	41624.2			1908	144	9
A70 Chemical Waste	30-gal	2	0.2	99.3	3.9						1.8	0.3	1.0	1.0	2		
	55-gal	6	1.2	377.6	62.7						48.0	4.6	20.0	10.6	5	1	
	Casks[a]																
	Crates																
	Other																
	Subtotal	8	1.4	476.9	66.6						49.8	4.9			7	1	0
A72 Hg	30-gal																
	55-gal	1	0.2	31.2	1.1						0.5	0.1	4.0	4.0	1		
	Casks[a]																
	Crates																
	Other																
	Subtotal	1	0.2	31.2	1.1						0.5	0.1			1	0	0
A74 Ion Exchange Resin	30-gal																
	55-gal	1	0.2	40.0	54.0						24.5	3.9	6.0	6.0	1		
	Casks[a]																
	Crates																
	Other																
	Subtotal	1	0.2	40.0	54.0						24.5	3.9			1	0	0

Notes: v Np-237 3.0, U-12 66111.0, U-235 898.0, U-20 25290.0, U-238 18.0 grams.

LOS ALAMOS NATIONAL LABORATORY TRU WASTES IN STORAGE THROUGH CY 1985

Waste Code & Descrip.	Type of Package	No. of Pkgs	Volume (m^3)	Weight (kg)	Pu-239 (g)	Pu-238 (g)	Am-241 (g)	U-233 (g)	Other (g)	HFP/AP (Ci)	TRU Total Curies	TRU Alpha Curies	MAX mr Surf	AVE mr Surf	0-10 mr/hr	>10-100 mr/hr	>100 mr/hr
A75 Chemical Treatment Sludge	30-gal 55-gal Casks[a] Crates	5168	1076.3	1080657.2	6740.5	4.1	120.6				875.4	875.4	74.0	10.7	4619	549	
	Other[w]	2	0.6	424.1	0.5						0.1	0.1	3.0	2.5	2		
	Subtotal	5170	1076.9	1081081.3	6741.0	4.1	120.6				73708.1	41624.2			4621	549	0
A76 Cement Paste	30-gal 55-gal Casks[a] Crates	668	138.8	163635.1	6936.6	2.5	85.1	2.1			748.0	748.0	60.0	7.3	581	87	
	Other[x]	166	444.9	717765.0	962.8	1.8	3205.5		16755.8[y]	0.4	10476.8	10476.8	1.0	1.0	166		
	Subtotal	834	583.7	881400.1	7899.4	4.3	3290.6	2.1	16755.8	0.4	11224.8	11224.8			747	87	0
A77 Vermiculite	30-gal 55-gal Casks[a] Crates Other	11	2.2	556.0	0.2						0.3	0.1	2.0	1.5	11		
	Subtotal	11	2.2	556.0	0.2						0.3	0.1			11	0	0
A80 Sources	30-gal 55-gal Casks[a] Crates Other	1	0.2	136.1	0.0				0.9[z]		0.9	0.9	100.0	100.0		1	
	Subtotal	1	0.2	136.1	0.0				0.9		0.9	0.9			0	1	0

Notes: w Other: 83-gal overpack drums.
x Other: 8 83-gal overpacks and 158 Corrugated Metal Pipes (CMPs) set vertically in ground and filled with cement paste.
y U-12 16002.0, U-235 622.8, U-238 131.0 grams.
z Ra-226

LOS ALAMOS NATIONAL LABORATORY TRU WASTES IN STORAGE THROUGH CY 1985

Waste Code & Descrip.	Type of Package	No. of Pkgs	Volume (m^3)	Weight (kg)	Pu-239 (g)	Pu-238 (g)	Am-241 (g)	U-233 (g)	Other (g)	MFP/AP (Ci)	TRU Total Curies	TRU Alpha Curies	MAX mr Surf	AVE mr Surf	0-10 mr/hr	>10-100 mr/hr	>100 mr/hr
A85 Firing Site Residue	30-gal																
	55-gal	1	0.2	216.1	0.2						0.03	0.03	6.0	6.0	1		
	Casks[a]																
	Crates	2	3.2	453.6	106.0						48.1	7.6	0.0	0.0	2		
	Other																
	Subtotal	3	3.4	669.7	106.2						48.13	7.63			3	0	0
A90 Contaminated Soil	30-gal																
	55-gal	49	10.2	8930.4	0.7						0.1	0.1	1.0	0.5	49		
	Casks[a]																
	Crates	49	121.1	78672.6	452.0						66.3	28.7	5.0	0.2	49		
	Other																
	Subtotal	98	131.3	87603.0	452.7						66.4	28.8			98	0	0
A95 Glass	30-gal	3	0.3	105.3	1.7						0.8	0.1	1.0	0.3	3		
	55-gal	302	60.4	21494.3	6731.9	0.1	0.2			0.02	4659.6	493.5	190.0	4.0	278	23	1
	Casks[a]	4	1.9	162.0		20.4					317.3	307.7	4.0	1.5	4		
	Crates																
	Other																
	Subtotal	309	62.6	21761.6	6733.6	20.5	0.2			0.02	4977.7	801.3			285	23	1
A99 Unidentified	30-gal	2	0.2	77.6	0.3				0.3[aa]		0.1	0.02	1.0	0.5	2		
	55-gal	5	1.0	249.4	0.2						0.1	0.01	1.0	0.2	5		
	Casks[a]																
	Crates	1	3.6	332.0							0.0	0.0	0.0	0.0	1		
	Other																
	Subtotal	8	4.8	659.0	0.5				0.3		0.2	0.03			8	0	0

Notes: aa Np-237

APPENDIX B

Packaging Characteristics of Los Alamos Stored TRU Wastes through CY 85

LOS ALAMOS NATIONAL LABORATORY
STORED TRU-WASTES THROUGH CY85

Container Type and Description	External Dimensions	CH/ /RH	Placement-Storage Mode	Inside Configuration	Contents	Num. of Contain.	Volume (m^3)
30-gal 17H mild steel (black iron) drum sealed with "rubber" gasket.	Diam: 0.48m Length: 0.74m	CH	Drums only used thru 1975. All are on the below ground storage pad.	Loose waste administratively segregated within TRU work areas. Glovebox waste packaged in small cans, boxes, bagout bags.	General laboratory wastes such as paper, plastic, glassware, gloves, small tools, rags, etc. MAJOR RADIONUCLIDE: ^{239}Pu 0-0.1 R/hr gamma at contact.	513	55.3
55-gal (57.2-gal) 17C mild steel (black iron) drum. Since late 1975 all drums obtained directly from Rocky Flats Plant to their specifications. Gasket seal has varied as RFP has modified specs. Pre-1975 drums sealed w/ standard "rubber" gasket.	Diam: 0.61m Length: 0.89m	CH	All drums in pad type storage (above and below ground)	Same as 30-gal drum Only drums of oil and sludges have a 2.3mm rigid liner in all cases; most drums do not have a rigid liner. All drums have a minimum 0.13mm plastic liner.	Contents same as 30-gal drum, plus vacuum dried sludge, solidified cement paste, absorbed oil. MAJOR RADIONUCLIDES: ^{239}Pu, ^{238}Pu, ^{241}Am, MFP 0-0.3 R/hr gamma at contact.	17270	3517.3
Fiberglass Reinforced Plywood Box.	1.2x1.2x2.1m or made to order for special waste max size up to 2.4x3.0x 10.6m	CH	Pad type storage above or below ground.	Waste items may be wrapped in plastic, painted, or have openings sealed to contain contamination.	Larger equipment items, piping, ductwork, bldg. debris, soil, HEPA filters. MAJOR RADIONUCLIDES: ^{239}Pu, ^{238}Pu, MFP 0-0.7 R/hr gamma at contact w/one exception at 1.5 R/hr.	397	2615.4
Steel spheres with 2 in. thick walls.	Approx. 3 ft. diam spheres.	CH	Above-ground pad storage.	Sphere is empty except for residual contamination.	Sphere is waste, as such, is unpackaged. MAJOR RADIONUCLIDE: ^{239}Pu	3	1.2

LOS ALAMOS NATIONAL LABORATORY
STORED TRU-WASTES THROUGH CY85

Container Type and Description	External Dimensions	CH/ /RH	Placement-Storage Mode	Inside Configuration	Contents	Num. of Contain.	Volume (m^3)
Steel spheres with 2 in. thick walls.	Approx. 6 ft. diam spheres.	CH	Above-ground pad storage.	Sphere is empty except for residual contamination.	Sphere is waste, as such, is unpackaged. MAJOR RADIONUCLIDE: ^{239}Pu	4	12.8
Concrete casks containing 2 30-gal drums. Casks constructed in accordance with ASTM C76 specs for reinforced pipe 24" ID, class II, "B" wall. Concrete strength 4000 psi minimum. 3" min reinforced wall thickness. Exterior surface coated with coal-tar epoxy; some also with asphalt roofing type compound.	Exterior Diam 0.90m max. Length: 1.82m	CH	Casks are set in a shallow trench Following filling w/drums and and sealing lids on with asphalt roofing-type compound, tops are covered with galvanized sheet and then covered with 2m of backfill.	Vertical placement in shallow trenches	^{238}Pu waste in 30-gal drums. ^{233}U waste placed in 3- or 15-gal inner container sealed in concrete centered in 30-gal drums. MAJOR RADIONUCLIDES: ^{233}U, ^{238}Pu, ^{239}Pu 0-0.25 R/hr gamma at contact with contained drums	359	339.1
83-gal mild steel (black iron drum; 16 gauge body and heads; two rolled or swedged-type hoops; 12 gauge bolted ring with drop forged lugs and 5/8" bolt.	Diam: 0.70m Length: 0.95m	CH	All drums in pad type storage above or below ground.	Used as overpack for 55-gal drums.	To date, contain only sludge and cement paste. Other wastes possible. MAJOR RADIONUCLIDES: ^{239}Pu, ^{241}Am 0-0.003 R/hr gamma at contact.	10	3.1
Corrugated Metal Pipe (CMP) 16 gauge, continuous butt welded seam, zinc coated w/16 gauge welded to cap one end.	Diam: 0.76m Length: 6.1m	CH	Placed vertically in an excavation with plate capped end down.	Lower end sealed with 0.3m plug of cold concrete; 0.3m plug of cold concrete poured in top when full.	Neutral, aqueous waste & sludge (not dewatered) w/ cement mixed in pug mill. Paste pumped into CMP. MAJOR RADIONUCLIDES: ^{239}Pu, ^{238}Pu, ^{241}Am, MFP 0-0.001R/hr gamma contact	158	442.4

LOS ALAMOS NATIONAL LABORATORY
STORED TRU-WASTES THROUGH CY85

Container Type and Description	External Dimensions	CH/ /RH	Placement-Storage Mode	Inside Configuration	Contents	Num. of Contain.	Volume (m^3)
Oversize mild steel drums with removable heads and "rubber" gasket. Drums are thought to be military surplus.	4 drums are 0.92m diam by 1.82m long. 2 drums are 1.22m diam by 1.82m long.	CH	Placed on below ground storage pad. One time use only.	Wastes from laboratory decontamination following accidental release. Plastic bags and wrapped items fill drums.	Waste is mostly equipment and other debris in plastic bags and wrapping. MAJOR RADIONUCLIDES: ^{239}Pu - 0.0 R/hr gamma at contact.	6	9.9
Steel and concrete casks. 2 mild steel pipes, one 0.23-0.3m ID by 2.3-3.7m long, the other 0.61m OD by 2.9-4.3m long. Both are sealed at one end w/ steel plate. Smaller pipe is centered in the larger and partially enclosed in concrete. Outer pipes have been both smooth wall and corrugated.	Diam: 0.61m Length: up to 4.4m (including lifting devices)	RH	Casks stand vertically in individually augered shafts. Concrete is used to seal around cask tops in the shafts.	Hot cell wastes packaged in 3.8L paint-type cans, sealed in a plastic container, then bagged.	Wastes include hot-cell trash, wipes, glassware, small tools, absorbed liquids, plastics, etc. MAJOR RADIONUCLIDES: ^{239}Pu and ^{235}U.	23	25.5
Steel pipe, capped at bottom with welded steel plate.	Diam: 0.81m Length: 4.1m	RH	Same as above.	Core of Los Alamos Molten Plutonium Reactor Experiment encased in concrete	Cylindrical stainless steel reactor core containing an estimated 200 grams ^{239}Pu.	1	2.1
Steel pipe 23cm diam by 0.64cm wall by 2.54m long with latching lid and lifting ring. Not sealed.	23cm diam by 2.62m overall (including lifting ring)	RH	Pipes stand vertically in individually augered shafts. Shaft tops protected w/cut-down drums	Hot cell wastes in 3.8L paint cans, in a rigid plastic can in a 0.3cm-wall welded steel can. 7 pipes w/8 cans, 1 w/7, and 1 w/3.	Wastes include hot cell trash, spent-fuel sample preparation residues, cladding, tissue, small tools, etc. MAJOR RADIONUCLIDES: ^{239}Pu and ^{235}U.	9	1.0

LOS ALAMOS NATIONAL LABORATORY
STORED TRU-WASTES THROUGH CY85

Container Type and Description	External Dimensions	CH/ /RH	Placement-Storage Mode	Inside Configuration	Contents	Num. of Contain.	Volume (m^3)
WIPP-approved steel box with welded closure.	68"L x 54"W x 38.5"H	CH	Above-ground pad storage.	Plastic sheet and fiberboard liners.	Sectioned gloveboxes and scrap metal. MAJOR RADIONUCLIDE: ^{239}Pu 0-1.5 mR/hr contact.	8	18.6
WIPP-approved steel box with welded closure.	88"L x 54"W x 54"H	CH	Above-ground pad storage.	FRP coated plywood box.	Gloveboxes, scrap metal, decommissioning waste. MAJOR RADIONUCLIDE: ^{239}Pu 0.0 mR/hr contact.	3	12.6
80-gal drum	unknown	CH	On below-ground storage pad.	unknown	Equipment waste. MAJOR RADIONUCLIDE: ^{239}Pu	1	0.3
Steel can, welded closed with filter vent.	21 cm diam. x 0.3 cm wall x 30 cm high	RH	Stored in unused hot cells.	Hot cell wastes in 3.8-L paint cans, inside a rigid plastic can.	Wastes include hot cell trash, spent-fuel sample preparation residues, cladding, tissue, small tools, etc. MAJOR RADIONUCLIDES: ^{239}Pu and ^{235}U.	50	0.5

APPENDIX C

Los Alamos TRU Wastes Stored in FRP-Wood Boxes through CY 85

TRU CRATES IN STORAGE AT LOS ALAMOS

RSWD#	TAG#	WASTE CODE	NUC-ID	GRAMS	α-CURIES	NUC-ID	GRAMS	α-CURIES	NUC-ID	GRAMS	α-CURIES
S730365	001001	A31	PU238	.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
S730364	001002	A31	PU238	.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
S730379	001003	A31	PU238	.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
S731101	001004	A31	PU238	15.0000	261.000		.000000E+00	.000000E+00		.000000E+00	.000000E+00
S002005	001005	A31	U233	.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
S002006	001006	A31	U233	.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
S710873	001007	A31	PU239	.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
S002008	001008	A31	U233	.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
S710872	001009	A31	PU239	.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
S720383	001010	A30	PU239	.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
S002011	001011	A31	U233	.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
S002012	001012	A31	U233	.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
S710859	001013	A31	PU239	.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
S710058	001014	A31	PU239	.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
S002015	001015	A31	U233	.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
S002016	001016	A31	U233	.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
S002017	001017	A31	U233	.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
S002018	001018	A31	U233	.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
S002019	001019	A31	U233	.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
S731085	001020	A31	PU238	8.00000	139.200		.000000E+00	.000000E+00		.000000E+00	.000000E+00
S002021	001021	A55	PU238	.000000E+00	.000000E+00	PU239	.000000E+00	.000000E+00		.000000E+00	.000000E+00
S730840	001022	A31	PU239	.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
S730327	001023	A31	PU239	.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
S730326	001024	A31	PU239	.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
S720374	001025	A55	PU238	.000000E+00	.000000E+00	PU239	.000000E+00	.000000E+00		.000000E+00	.000000E+00
S730338	001026	A30	PU238	.100000	1.74000		.000000E+00	.000000E+00		.000000E+00	.000000E+00
S730333	001027	A31	PU239	.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00

S710071	001020	A31	PU239	.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
				.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
S730325	001029	A31	PU239	.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
				.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
S710068	001030	A30	PU239	.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
				.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
S710069	001031	A31	PU239	.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
				.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
S720372	001031	A31	MFP	.000000E+00	.000000E+00	PU239	.000000E+00	.000000E+00		.000000E+00	.000000E+00
				.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
S730324	001032	A31	PU239	.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
				.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
S710067	001033	A31	PU239	.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
				.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
S731087	001034	A55	PU238	.000000E+00	.000000E+00	PU239	.000000E+00	.000000E+00		.000000E+00	.000000E+00
				.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
S730332	001035	A31	PU239	.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
				.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
S710066	001036	A31	PU239	.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
				.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
S710065	001037	A31	PU239	.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
				.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
S710064	001038	A31	PU239	.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
				.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
S710063	001039	A31	PU239	.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
				.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
S710062	001040	A31	PU239	.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
				.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
S730323	001041	A31	PU239	.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
				.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
S731129	001042	A55	PU238	.000000E+00	.000000E+00	PU239	.000000E+00	.000000E+00		.000000E+00	.000000E+00
				.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
S710061	001043	A31	PU239	.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
				.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
S710057	001044	A31	PU239	.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
				.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
S731124	001045	A55	PU238	.000000E+00	.000000E+00	PU239	.000000E+00	.000000E+00		.000000E+00	.000000E+00
				.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
S720031	001046	A31	PU239	.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
				.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
S720030	001047	A31	PU239	.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
				.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
S710060	001048	A31	PU239	.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
				.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
S720916	001049	A30	PU239	.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
				.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
S002050	001050	A55	PU239	.000000E+00	.000000E+00	PU238	.000000E+00	.000000E+00		.000000E+00	.000000E+00
				.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
S730395	001051	A31	AM241	.000000E+00	.000000E+00	PU238	.000000E+00	.000000E+00	PU239	.000000E+00	.000000E+00
				.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
S730396	001052	A31	AM241	.000000E+00	.000000E+00	PU238	.000000E+00	.000000E+00	PU239	.000000E+00	.000000E+00
				.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
S002053	001053	A31	PU239	.000000E+00	.000000E+00	PU230	.000000E+00	.000000E+00		.000000E+00	.000000E+00
				.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
S720379	001054	A55	PU238	.000000E+00	.000000E+00	PU239	.000000E+00	.000000E+00		.000000E+00	.000000E+00
				.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
S720032	001055	A31	PU239	.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00
				.000000E+00	.000000E+00		.000000E+00	.000000E+00		.000000E+00	.000000E+00

S720377	001056	A55	PU238	.000000E+00 .000000E+00	.000000E+00 .000000E+00	PU239	.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S720378	001057	A55	PU238	.000000E+00 .000000E+00	.000000E+00 .000000E+00	PU239	.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S720034	001058	A31	PU239	.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S720373	001059	A55	PU238	.000000E+00 .000000E+00	.000000E+00 .000000E+00	PU239	.000000E+00 .000000E+00	.000000E+00 .000000E+00	U235	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S720035	001060	A31	PU239	.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S720029	001062	A55	PU238	.000000E+00 .000000E+00	.000000E+00 .000000E+00	PU239	.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S720033	001063	A31	PU239	.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S720915	001064	A31	PU238	.000000E+00 .000000E+00	.000000E+00 .000000E+00	PU239	.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S731086	001065	A55	PU238	.000000E+00 .000000E+00	.000000E+00 .000000E+00	PU239	.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S002066	001066	A55	PU238	.000000E+00 .000000E+00	.000000E+00 .000000E+00	PU239	.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S720375	001067	A31	PU238	.000000E+00 .000000E+00	.000000E+00 .000000E+00	PU239	.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S720376	001068	A55	PU238	.000000E+00 .000000E+00	.000000E+00 .000000E+00	PU239	.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S720914	001069	A31	PU239	.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S710070	001070	A31	PU239	.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S730404	001071	A31	AM241	.000000E+00 .000000E+00	.000000E+00 .000000E+00	PU238	.000000E+00 .000000E+00	.000000E+00 .000000E+00	PU239	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S720382	001072	A31	PU238	.000000E+00 .000000E+00	.000000E+00 .000000E+00	PU239	.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S720381	001073	A31	PU239	.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S720912	001074	A36	PU238	.000000E+00 .000000E+00	.000000E+00 .000000E+00	PU239	.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S730340	001075	A31	PU239	.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S720380	001076	A31	PU239	.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S002077	001077	A99	PU239	.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S001102	001078	A30	PU238	.574713E-01 .000000E+00	1.00000 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S001101	001079	A30	PU238	.574713E-01 .000000E+00	1.00000 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S001970	001080	A31	PU239	34.0000 .000000E+00	2.00760 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S003771	001081	A31	PU52	26.0000 .000000E+00	1.85300 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S003772	001082	A31	PU52	26.0000 .000000E+00	1.85300 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S003766	001083	A31	PU52	26.0000 .000000E+00	1.85300 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S760704	001085	A31	PU239	.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00

S761218	001085	A30	PU239	.0000000E+00	.6140000E-02		.0000000E+00	.0000000E+00	.0000000E+00	.0000000E+00
S761919	001085	A30	PU239	.0000000E+00	.0000000E+00		.0000000E+00	.0000000E+00	.0000000E+00	.0000000E+00
S762528	001005	A30	PU238	.0000000E+00	.0000000E+00	PU239	.0000000E+00	.0000000E+00	.0000000E+00	.0000000E+00
S760529	001086	A31	PU52	26.0000 .0000000E+00	1.85380 .0000000E+00		.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00
S762436	001087	A31	PU52	26.0000 .0000000E+00	1.85380 .0000000E+00		.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00
S760054	001088	A31	PU52	26.0000 .0000000E+00	1.85380 .0000000E+00		.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00
S760528	001089	A31	PU52	26.0000 .0000000E+00	1.85380 .0000000E+00		.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00
S762437	001090	A31	PU52	26.0000 .0000000E+00	1.85380 .0000000E+00		.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00
S760530	001091	A31	PU52	26.0000 .0000000E+00	1.85380 .0000000E+00		.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00
S760532	001092	A31	PU52	26.0000 .0000000E+00	1.85380 .0000000E+00		.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00
S760531	001093	A31	PU52	26.0000 .0000000E+00	1.85380 .0000000E+00		.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00
S762062	001094	A31	PU52	28.0000 .0000000E+00	1.97640 .0000000E+00		.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00
S773049	001095	A31	PU52	29.0000 .0000000E+00	2.06770 .0000000E+00		.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00
S773050	001096	A31	PU52	29.0000 .0000000E+00	2.06770 .0000000E+00		.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00
S773052	001097	A31	PU52	28.0000 .0000000E+00	1.97641 .0000000E+00		.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00
S703729	001098	A31	PU52	29.0000 .0000000E+00	2.06771 .0000000E+00		.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00
S773034	001099	A55	PU238	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	PU239	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00
S773035	001100	A55	PU238	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	PU239	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00
S773036	001101	A55	PU238	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	PU239	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00
S773037	001102	A55	PU238	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	PU239	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00
S773038	001103	A55	PU238	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	PU239	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00
S771424	001104	A31	PU238	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	PU239	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00
S771425	001105	A31	PU238	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	PU239	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00
S771421	001106	A31	PU238	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	PU239	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00
S771422	001107	A31	PU238	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	PU239	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00
S771423	001108	A31	PU238	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	PU239	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00
S771433	001109	A30	PU238	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	PU239	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00
S771434	001110	A30	PU238	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	PU239	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00
S771432	001111	A30	PU238	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	PU239	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00

S771431	001112	A30	PU238	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	PU239	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00		.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00
S770665	001113	A30	PU239	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00		.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00		.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00
S770666	001114	A30	PU239	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00		.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00		.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00
S770667	001115	A30	PU239	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00		.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00		.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00
S770668	001116	A30	PU239	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00		.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00		.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00
S770669	001117	A30	PU239	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00		.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00		.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00
S770670	001118	A30	PU239	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00		.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00		.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00
S771526	001119	A55	PU238	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	PU239	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	U235	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00
S771527	001120	A55	PU238	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	PU239	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	U235	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00
S771528	001121	A55	PU238	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	PU239	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	U235	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00
S771529	001122	A55	PU238	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	PU239	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	U235	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00
S771530	001123	A55	PU238	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	PU239	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	U235	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00
S771531	001124	A55	PU238	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	PU239	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	U235	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00
S770679	001125	A30	PU238	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	PU239	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00		.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00
S704633	001126	A31	PU239	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00		.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00		.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00
S771585	001127	A30	PU239	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00		.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00		.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00
S771586	001128	A30	PU239	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00		.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00		.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00
S771588	001129	A31	PU238	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	PU239	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00		.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00
S771589	001130	A31	PU238	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	PU239	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00		.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00
S771590	001131	A31	PU238	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00	PU239	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00		.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00
S771705	001132	A31	PU52	29.0000 .0000000E+00	2.06770 .0000000E+00		.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00		.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00
S771784	001133	A31	PU52	29.0000 .0000000E+00	2.06770 .0000000E+00		.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00		.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00
S004110	001135	A31	MFP	.0000000E+00 .0000000E+00	1.00000 .0000000E+00	PU239	6.00000 .0000000E+00	.368400 .0000000E+00	U235	14.0000 .0000000E+00	.299600E-04 .0000000E+00
S004111	001135	A31	PU239	16.2900 .0000000E+00	1.00021 .0000000E+00		.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00		.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00
S004112	001135	A31	PU239	.277200E-02 .0000000E+00	.6000001E-03 .0000000E+00		.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00		.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00
S004113	001135	A31	PU238	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00		.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00		.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00
S004114	001135	A31	AM241	.2767000E-03 .0000000E+00	.2612356E-03 .0000000E+00		.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00		.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00
S700604	001136	A31	PU239	.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00		.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00		.0000000E+00 .0000000E+00	.0000000E+00 .0000000E+00

S781777	001137	A31	PU239	.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S781769	001138	A30	PU238	.000000E+00 .000000E+00	.000000E+00 .000000E+00	PU239	.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S783476	001139	A30	PU239	.586300E-01 .000000E+00	.359900E-02 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S780406	001140	A30	PU239	.602600E-01 .000000E+00	.362976E-02 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S781768	001141	A31	PU239	.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S781009	001142	A30	PU238	.200000 .000000E+00	3.40000 .000000E+00	PU239	38.0000 .000000E+00	2.33320 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S781595	001143	A31	PU239	.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S781593	001144	A30	PU238	.000000E+00 .000000E+00	.000000E+00 .000000E+00	PU239	3.00000 .000000E+00	.184200 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S781767	001145	A31	PU238	.000000E+00 .000000E+00	.000000E+00 .000000E+00	PU239	.000000E+00 .000000E+00	.000000E+00 .000000E+00	U235	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S781080	001146	A31	PU239	.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S781594	001147	A30	PU239	.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S781010	001148	A31	PU239	.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S782745	001149	A31	PU239	.000000 .000000E+00	.491200E-01 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S793924	003401	A30	PU239	.610893E-01 .000000E+00	.380000E-02 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S793925	003402	A30	PU239	.651466E-01 .000000E+00	.400000E-02 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000F+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S793923	003403	A30	PU238	.132180E-03 .000000E+00	.230000E-02 .000000E+00	PU239	.586319E-01 .000000E+00	.360000E-02 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S793926	003404	A31	PU239	.553746E-01 .000000E+00	.340000E-02 .000000F+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S793928	003405	A30	PU239	50.4986 .000000E+00	3.10000 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S793929	003406	A30	PU239	.610749E-01 .000000E+00	.375000E-02 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000F+00	.000000E+00 .000000E+00
S793927	003407	A31	PU239	.644322E-01 .000000E+00	.395000E-02 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S793933	003408	A31	PU239	.846906E-01 .000000E+00	.520000E-02 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S793930	003409	A31	PU239	.131757 .000000E+00	.807000E-02 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S793679	003411	A30	PU238	1.00000 .000000E+00	17.4000 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S793977	003412	A31	PU03	.590000 .000000E+00	8.20100 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000F+00	.000000E+00 .000000E+00
S793932	003415	A31	PU239	.671810E-01 .000000E+00	.412000E-02 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000F+00	.000000E+00 .000000E+00
S793931	003416	A31	PU239	.627036E-01 .000000E+00	.385000E-02 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S793015	003417	A31	PU239	340.000 .000000E+00	21.3672 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000F+00	.000000E+00 .000000E+00
S792093	003418	A31	PU239	274.000 .000000E+00	16.8236 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000F+00	.000000E+00 .000000E+00

S792106	003419	A31	PU238	7.70000 .000000E+00	133.900 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	
S792107	003420	A31	PU238	7.70000 .000000E+00	133.900 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	
S792108	003421	A31	PU238	7.70000 .000000E+00	133.900 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	
S792109	003422	A31	PU238	.960000 .000000E+00	16.7040 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	
S792065	003423	A31	PU238	.400000E-02 .000000E+00	.674000E-01 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	
S792090	003424	A31	PU239	300.000 .000000E+00	18.4200 .000000E+00		.000000E+00 .000000F+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	
S792092	003425	A31	PU239	.675000E-01 .000000E+00	.414450E-02 .000000F+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	
S792091	003426	A31	PU239	.670000E-01 .000000E+00	.411300E-02 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	
S792028	003427	A30	PU230	.200000E-01 .000000E+00	.340000 .000000E+00	PU239	.307000E-02 .000000E+00	.104490E-03 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000F+00	
S792064	003428	A31	PU239	.400000E-02 .000000E+00	.245600E-03 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	
S792038	003429	A30	PU239	.670000E-01 .000000E+00	.423660E-02 .000000F+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000F+00	
S791971	003430	A30	PU238	.320000E-02 .000000E+00	.556000E-01 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	
S791972	003431	A31	PU238	.175000E-02 .000000E+00	.304500E-01 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	
S791974	003432	A31	PU239	.653000E-01 .000000E+00	.400242E-02 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	
S791973	003433	A31	PU238	.362000E-02 .000000E+00	.629000E-01 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	
S791970	003434	A30	PU238	.207000E-02 .000000E+00	.360100E-01 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	
S792000	003435	A30	PU238	.283000E-02 .000000E+00	.492420E-01 .000000E+00	PU239	.768000E-01 .000000E+00	.471552E-02 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	
S791991	003436	A31	PU238	385200 .000000E+00	6.70248 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	
S792006	003437	A31	PU238	4.64400 .000000E+00	80.8056 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	
S792125	003438	A31	PU238	19.8700 .000000E+00	345.738 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	
S792054	003443	A31	PU238	7.92400 .000000E+00	137.808 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	
S792212	003444	A19	PU239	.420000E-01 .000000E+00	.257880E-02 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	
S791975	003445	A31	PU239	.573000E-01 .000000E+00	.351822E-02 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	
S791968	003446	A31	PU239	338.000 .000000E+00	20.7532 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	
S792016	003447	A31	PU239	347.000 .000000E+00	21.3058 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	
S792213	003448	A90	PU239	3.85000 .000000E+00	.236390 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	
S792214	003449	A90	PU239	220000 .000000E+00	.135080E-01 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	
S792215	003450	A90	PU239	.180000 .000000E+00	.110520E-01 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	

S791976	003451	A31	PU239	.667000E-01 .000000E+00	.107530E-02 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S792211	003452	A90	PU239	4.75000 .000000E+00	.291650 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S792129	003453	A30	PU238	7.20000 .000000E+00	125.280 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S791999	003454	A31	PU238	1.38300 .000000E+00	24.0642 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S792055	003455	A31	PU238	3.20000 .000000E+00	30.4192 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S792116	003456	A30	PU239	1.00000 .000000E+00	.614000E-01 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S792122	003457	A31	PU238	.100000E-01 .000000E+00	.313200 .000000E+00	PU239	5.21000 .000000E+00	.319094 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S794038	003458	A30	PU239	84.3000 .000000E+00	5.17602 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S791977	003459	A30	PU238	.424000E-02 .000000E+00	.737760E-01 .000000E+00	PU239	.625000E-01 .000000E+00	.383750E-02 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S794039	003460	A90	PU239	.862000 .000000E+00	.529368E-01 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S791979	003461	A30	PU239	.668000E-01 .000000E+00	.410152E-02 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S794029	003462	A31	PU238	.120000 .000000E+00	2.08800 .000000E+00	PU239	119.000 .000000E+00	7.30660 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S791990	003464	A31	PU239	.650000E-01 .000000E+00	.399100E-02 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S803565	003465	A30	PU238	.459770E-02 .000000E+00	.800000E-01 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S794036	003466	A30	PU239	189.800 .000000E+00	6.74172 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S792126	003467	A31	PU238	.120000E-01 .000000E+00	.200800 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S792005	003468	A31	PU238	2.04000 .000000E+00	35.4960 .000000E+00		.000000E+00 .000000E+00	.000000F+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S792128	003469	A31	PU238	3.88800 .000000E+00	67.6512 .000000E+00		.000000E+00 .000000E+00	.000000F+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S794037	003470	A31	PU239	71.2000 .000000E+00	4.41466 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S792118	003471	A30	PU239	80.3040 .000000E+00	4.93042 .000000E+00		.000000E+00 .000000E+00	.000000F+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S794032	003472	A31	PU239	86.0300 .000000E+00	5.28224 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S794035	003473	A31	PU238	.114000 .000000E+00	1.98360 .000000E+00	PU239	48.0000 .000000E+00	2.94720 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S792121	003474	A31	PU239	21.0000 .000000E+00	1.28940 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S792110	003475	A31	PU239	1.65000 .000000E+00	.101310 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S792120	003476	A30	PU239	72.0000 .000000E+00	4.42080 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S792007	003477	A30	PU238	1.20000 .000000E+00	20.3000 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S792216	003478	A90	PU239	.180000 .000000E+00	.110500E-01 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S792123	003479	A31	PU238	10.5600 .000000E+00	183.744 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00

S791996	003480	A30	PU239	.766000E-01 .000000E+00	.470324E-02 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S792004	003481	A31	PU238	.672200 .000000E+00	11.8181 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S794033	003482	A31	PU239	66.5000 .000000E+00	4.08310 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S792002	003483	A31	PU239	8.63900 .000000E+00	.542715 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S794031	003484	A31	PU238	.120000 .000000E+00	2.08800 .000000E+00	PU239	87.0000 .000000E+00	5.34180 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S792124	003485	A31	PU238	18.0000 .000000E+00	313.200 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S794045	003486	A90	PU239	6.38800 .000000E+00	.392223 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S794046	003487	A90	PU239	6.38800 .000000E+00	.392223 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S794044	003488	A90	PU239	6.38800 .000000E+00	.392223 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S792119	003489	A30	PU238	.600000 .000000E+00	18.4400 .000000E+00	PU239	.155000 .000000E+00	.951700E-02 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S794030	003490	A30	PU239	7.94400 .000000E+00	.487762 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S793996	003491	A30	PU239	.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S794028	003491	A30	PU239	291.200 .000000E+00	17.8797 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S794056	003492	A90	PU239	3.83000 .000000E+00	.235162 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S794055	003493	A90	PU239	3.83000 .000000E+00	.235162 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S794063	003495	A31	PU239	10.5000 .000000E+00	.644700 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S794064	003495	A31	PU239	296.000 .000000E+00	18.1744 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S794034	003496	A31	PU239	35.1500 .000000E+00	2.15821 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S794074	003497	A30	PU239	131.700 .000000E+00	8.08638 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S794076	003498	A30	PU239	27.8600 .000000E+00	1.71060 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S794065	003499	A31	PU239	9.00000 .000000E+00	.552600 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S794075	003500	A31	PU238	13.8900 .000000E+00	241.686 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S794066	003501	A31	PU239	4.00000 .000000E+00	.245600 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S794072	003502	A31	PU239	28.4000 .000000E+00	1.74376 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S794071	003503	A30	PU238	5.92000 .000000E+00	103.008 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S794070	003504	A31	PU239	21.1000 .000000E+00	1.29554 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S792700	003505	A55	PU238 U238	.000000E+00 .000000E+00	.000000E+00 .000000E+00	PU239	.000000E+00 .000000E+00	.000000E+00 .000000E+00	U235	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S792701	003506	A55	PU238 U238	.000000E+00 .000000E+00	.000000E+00 .000000E+00	PU239	.000000E+00 .000000E+00	.000000E+00 .000000E+00	U235	.000000E+00 .000000E+00	.000000E+00 .000000E+00

S792702	003507	A55	PU238 U238	.000000E+00 .000000E+00	.000000E+00 .000000E+00	PU239	.000000E+00 .000000E+00	.000000E+00 .000000E+00	U235	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S792703	003508	A55	PU238 U238	.000000E+00 .000000E+00	.000000E+00 .000000E+00	PU239	.000000E+00 .000000E+00	.000000E+00 .000000E+00	U235	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S792704	003509	A55	PU238 U238	.000000E+00 .000000E+00	.000000E+00 .000000E+00	PU239	.000000E+00 .000000E+00	.000000E+00 .000000E+00	U235	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S794126	003510	A31	PU238	1.20000 .000000E+00	20.8800 .000000E+00	PU239	61.0000 .000000E+00	3.74540 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S794124	003511	A31	PU239	151.000 .000000E+00	9.27140 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S794123	003512	A90	PU239	306600 .000000E+00	.180252E-01 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S794121	003513	A90	PU239	306600 .000000E+00	.180252E-01 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S794122	003514	A90	PU239	306600 .000000E+00	.180252E-01 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S794094	003515	A05	PU239	51.0000 .000000E+00	3.25420 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S794093	003516	A05	PU239	51.0000 .000000E+00	3.25420 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S794125	003517	A31	PU239	243.000 .000000E+00	14.9202 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S794059	003518	A31	PU238	.500000E-02 .000000E+00	.870000E-01 .000000E+00	PU239	.500000 .000000E+00	.307000E-01 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S792229	003519	A19	PU239	252000 .000000E+00	.1547286-01 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S794128	003520	A30	PU238	400000 .000000E+00	6.26000 .000000E+00	PU239	130000 .000000E+00	.798200E-02 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
9804604	003521	A90	PU239	306600 .000000E+00	.180252E-01 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S794118	003522	A90	PU239	306600 .000000E+00	.180252E-01 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
9804115	003522	A90	PU239	1.60700 .000000E+00	.9072261-01 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
9803564	003523	A52	PU239	12.6700 .000000E+00	2.61994 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
9803563	003524	A52	PU239	30.6300 .000000E+00	2.37188 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S794119	003525	A90	PU239	306600 .000000E+00	.180252E-01 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S792244	003526	A30	PU238	.175000E-03 .000000E+00	.304500E-02 .000000E+00	PU239	.144000E-01 .000000E+00	.084160E-03 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S794043	003527	A90	PU239	6.38500 .000000E+00	392039 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S794042	003528	A30	PU239	2.60000 .000000E+00	.159640 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S791740	003529	A19	PU54	2.00000 .000000E+00	.160600 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S791742	003530	A19	PU54	1.00000 .000000E+00	.803800E-01 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S791743	003531	A36	PU54	3.00000 .000000E+00	.240900 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
9803631	003531	A31	PU239	202.000 .000000E+00	12.4028 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00
S794155	003532	A31	PU239	345.400 .000000E+00	21.2076 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00		.000000E+00 .000000E+00	.000000E+00 .000000E+00

S803632	003532	A31	PU239	344.000	21.1216		.000000E+00	.000000E+00	.000000E+00	.000000E+00
				.000000E+00	.000000E+00		.000000E+00	.000000E+00	.000000E+00	.000000E+00
S794154	003533	A31	PU239	353.300	15.5524		.000000E+00	.000000E+00	.000000E+00	.000000E+00
				.000000E+00	.000000E+00		.000000E+00	.000000E+00	.000000E+00	.000000E+00
S803634	003534	A31	PU239	159.500	9.79330		.000000E+00	.000000E+00	.000000E+00	.000000E+00
				.000000E+00	.000000E+00		.000000E+00	.000000E+00	.000000E+00	.000000E+00
S794152	003535	A31	PU239	281.400	17.2780		.000000E+00	.000000E+00	.000000E+00	.000000E+00
				.000000E+00	.000000E+00		.000000E+00	.000000E+00	.000000E+00	.000000E+00
S803635	003535	A31	PU238	1.50000	70.3000		.000000E+00	.000000E+00	.000000E+00	.000000E+00
				.000000E+00	.000000E+00		.000000E+00	.000000E+00	.000000E+00	.000000E+00
S803236	003536	A31	PU239	9.70000	.595580		.000000E+00	.000000E+00	.000000E+00	.000000E+00
				.000000E+00	.000000E+00		.000000E+00	.000000E+00	.000000E+00	.000000E+00
S803633	003538	A30	PU239	78.6000	4.82604		.000000E+00	.000000E+00	.000000E+00	.000000E+00
				.000000E+00	.000000E+00		.000000E+00	.000000E+00	.000000E+00	.000000E+00
S802608	003539	A35	PU54	.000000E+00	.000000E+00		.000000E+00	.000000E+00	.000000E+00	.000000E+00
				.000000E+00	.000000E+00		.000000E+00	.000000E+00	.000000E+00	.000000E+00
S802606	003540	A35	PU54	8.72500	.704633		.000000E+00	.000000E+00	.000000E+00	.000000E+00
				.000000E+00	.000000E+00		.000000E+00	.000000E+00	.000000E+00	.000000E+00
S803219	003541	A31	PU239	81.6000	5.01024		.000000E+00	.000000E+00	.000000E+00	.000000E+00
				.000000E+00	.000000E+00		.000000E+00	.000000E+00	.000000E+00	.000000E+00
S803221	003542	A31	PU239	277.200	17.0201		.000000E+00	.000000E+00	.000000E+00	.000000E+00
				.000000E+00	.000000E+00		.000000E+00	.000000E+00	.000000E+00	.000000E+00
S803218	003545	A31	PU239	19.8000	1.21572		.000000E+00	.000000E+00	.000000E+00	.000000E+00
				.000000E+00	.000000E+00		.000000E+00	.000000E+00	.000000E+00	.000000E+00
S803222	003547	A31	PU239	34.4760	2.11646		.000000E+00	.000000E+00	.000000E+00	.000000E+00
				.000000E+00	.000000E+00		.000000E+00	.000000E+00	.000000E+00	.000000E+00
S803220	003548	A31	PU239	757.000	46.4798		.000000E+00	.000000E+00	.000000E+00	.000000E+00
				.000000E+00	.000000E+00		.000000E+00	.000000E+00	.000000E+00	.000000E+00
S803237	003549	A31	PU239	7.80000	.483832		.000000E+00	.000000E+00	.000000E+00	.000000E+00
				.000000E+00	.000000E+00		.000000E+00	.000000E+00	.000000E+00	.000000E+00
S805336	003550	A31	PU239	673.600	41.3590		.000000E+00	.000000E+00	.000000E+00	.000000E+00
				.000000E+00	.000000E+00		.000000E+00	.000000E+00	.000000E+00	.000000E+00
S803228	003551	A52	PU239	1.80000	.110520		.000000E+00	.000000E+00	.000000E+00	.000000E+00
				.000000E+00	.000000E+00		.000000E+00	.000000E+00	.000000E+00	.000000E+00
S803223	003555	A90	PU239	1.60900	.987926E-01		.000000E+00	.000000E+00	.000000E+00	.000000E+00
				.000000E+00	.000000E+00		.000000E+00	.000000E+00	.000000E+00	.000000E+00
S805332	003559	A90	PU239	.500000	.307000E-01		.000000E+00	.000000E+00	.000000E+00	.000000E+00
				.000000E+00	.000000E+00		.000000E+00	.000000E+00	.000000E+00	.000000E+00
S805333	003560	A90	PU239	.400000	.245600E-01		.000000E+00	.000000E+00	.000000E+00	.000000E+00
				.000000E+00	.000000E+00		.000000E+00	.000000E+00	.000000E+00	.000000E+00
S803242	003563	A36	PU238	.400000E-01	.676000	PU239	341.400	20.9620	.000000E+00	.000000E+00
				.000000E+00	.000000E+00		.000000E+00	.000000E+00	.000000E+00	.000000E+00
S805331	003564	A90	PU239	9.76000	.611544		.000000E+00	.000000E+00	.000000E+00	.000000E+00
				.000000E+00	.000000E+00		.000000E+00	.000000E+00	.000000E+00	.000000E+00
S801293	003565	A55	PU238	.107100E-02	.186354E-01	PU239	.209300	.128510E-01	.000000E+00	.000000E+00
				.000000E+00	.000000E+00		.000000E+00	.000000E+00	.000000E+00	.000000E+00
S801290	003566	A55	PU238	.107100E-02	.186354E-01	PU239	.209300	.128510E-01	.000000E+00	.000000E+00
				.000000E+00	.000000E+00		.000000E+00	.000000E+00	.000000E+00	.000000E+00
S801287	003567	A55	PU238	.107100E-02	.186354E-01	PU239	.209300	.128510E-01	.000000E+00	.000000E+00
				.000000E+00	.000000E+00		.000000E+00	.000000E+00	.000000E+00	.000000E+00
S801286	003568	A30	PU238	.164400E-01	.206056		.000000E+00	.000000E+00	.000000E+00	.000000E+00
				.000000E+00	.000000E+00		.000000E+00	.000000E+00	.000000E+00	.000000E+00
S801292	003569	A55	PU238	.107100E-02	.186354E-01	PU239	.209300	.128510E-01	.000000E+00	.000000E+00
				.000000E+00	.000000E+00		.000000E+00	.000000E+00	.000000E+00	.000000E+00
S801291	003570	A55	PU238	.107100E-02	.186354E-01	PU239	.209300	.128510E-01	.000000E+00	.000000E+00
				.000000E+00	.000000E+00		.000000E+00	.000000E+00	.000000E+00	.000000E+00

S805335	003577	A90	PU239	6.90000 .000000E+00	.423660 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S805338	003580	A52	PU239	43.1500 .000000E+00	2.64741 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S805336	003583	A90	PU239	8.05000 .000000E+00	.494270 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S805337	003584	A90	PU239	16.1000 .000000E+00	.988540 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S805334	003591	A90	PU239	8.05000 .000000E+00	.494270 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S813226	003537	A90	PU239	.500000 .000000E+00	.307000E-01 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S813232	003543	A31	PU239	46.7000 .000000E+00	2.86738 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S813231	003544	A31	PU239	10.7000 .000000E+00	.656980 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S813235	003546	A31	PU239	250.400 .000000E+00	15.3746 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S813233	003552	A31	PU239	1.60000 .000000E+00	.982400E-01 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S813227	003553	A90	PU239	.500000 .000000E+00	.307000E-01 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S813381	003554	A90	PU239	.500000 .000000E+00	.307000E-01 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S813225	003556	A90	PU239	.500000 .000000E+00	.307000E-01 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S813332	003557	A90	PU239	13.2000 .000000E+00	.815392 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S813328	003558	A90	PU239	5.37000 .000000E+00	.329718 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S813330	003561	A90	PU239	.400000 .000000E+00	.245600E-01 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S813331	003562	A90	PU239	.400000 .000000E+00	.245600E-01 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S813224	003571	A90	PU239	.500000 .000000E+00	.307000E-01 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S813289	003572	A90	PU239	19.1600 .000000E+00	1.17642 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S813329	003573	A90	PU239	6.04000 .000000E+00	.370856 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S813319	003574	A90	PU239	11.5000 .000000E+00	.706180 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S813315	003575	A90	PU239	1.61000 .000000E+00	.988540E-01 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S813240	003576	A90	PU239	78.9100 .000000E+00	4.83893 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S813322	003578	A90	PU239	8.05000 .000000E+00	.494270 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S813320	003579	A90	PU239	13.2000 .000000E+00	.815392 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S813316	003581	A90	PU239	6.90000 .000000E+00	.423660 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S813317	003582	A90	PU239	9.96000 .000000E+00	.611544 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S813290	003585	A90	PU239	8.05000 .000000E+00	.494270 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00

S813241	003586	A90	PU239	.000000E+00	11.5000	.000000E+00	706100	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00
S811419	003587	A55	PU238	.000000E+00	.298051E-02	.000000E+00	.520000E-01	PU239	.390880	.000000E+00	.240000E-01	.000000E+00	.000000E+00	.000000E+00	.000000E+00
S811445	003588	A30	PU239	.000000E+00	22.5000	.000000E+00	1.38150	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00
S811446	003589	A30	PU239	.000000E+00	43.9000	.000000E+00	2.69546	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00
S811447	003590	A31	PU239	.000000E+00	26.8000	.000000E+00	1.64552	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00
S813323	003592	A90	PU239	.000000E+00	13.2800	.000000E+00	815392	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00
S813486	003593	A52	PU239	.000000E+00	7.53300	.000000E+00	462526	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00
S813120	003594	A30	PU54	.000000E+00	.249066E-01	.000000E+00	.200000E-02	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00
S811078	003595	A19	PU54	.000000E+00	.430000	.000000E+00	.345270E-01	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00
S813262	003595	A90	PU239	.000000E+00	143.700	.000000E+00	8.82318	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00
S811776	003596	A19	PU54	.000000E+00	.452055E-01	.000000E+00	.363000E-02	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00
S811774	003597	A19	PU54	.000000E+00	4.40000	.000000E+00	.353320	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00
S811801	003598	A19	PU54	.000000E+00	.160000	.000000E+00	.128400E-01	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00
S811879	003599	A19	PU54	.000000E+00	.405000	.000000E+00	.325215E-01	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00
S811883	003600	A19	PU54	.000000E+00	.247821E-01	.000000E+00	.199000E-02	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00
S811882	003601	A19	PU54	.000000E+00	1.12000	.000000E+00	.899360E-01	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00
S811773	003602	A31	AM241	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00
S811775	003603	A19	PU54	.000000E+00	.288000	.000000E+00	.231264E-01	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00
S812704	003605	A30	PU239	.000000E+00	5.53746	.000000E+00	.340000	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00
S811185	003608	A55	PU238	.000000E+00	.156322E-02	.000000E+00	.272000E-01	PU239	3.99023	.000000E+00	.245000	.000000E+00	.000000E+00	.000000E+00	.000000E+00
S811186	003609	A30	PU238	.000000E+00	.156400E-01	.000000E+00	.272136	PU239	.958200	.000000E+00	.580335E-01	.000000E+00	.000000E+00	.000000E+00	.000000E+00
S811681	003610	A30	PU54	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00
S811897	003611	A30	PU54	.000000E+00	.350000	.000000E+00	.281050E-01	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00
S811762	003612	A19	PU54	.000000E+00	.720000	.000000E+00	.578160E-01	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00
S811900	003613	A19	PU54	.000000E+00	1.00000	.000000E+00	.803000E-01	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00
S811679	003614	A19	PU54	.000000E+00	.800000	.000000E+00	.642400E-01	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00
S811761	003618	A31	PU54	.000000E+00	.590000	.000000E+00	.473270E-01	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00
S822955	003619	A52	PU42	.000000E+00	2.67000	.000000E+00	.403270	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00	.000000E+00

S822962	003620	A31	PU52	6.31500 .000000E+00	.450259 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S822526	003621	A30	PU54	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S822528	003622	A36	PU54	.520000 .000000E+00	.417560E-01 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S822529	003623	A36	PU54	.320000 .000000E+00	.256960E-01 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S822960	003624	A36	PU54	.484000E-01 .000000E+00	.308652E-02 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S822954	003625	A30	PU54	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S822525	003626	A36	PU54	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S821985	003627	A55	PU239	.997083E-01 .000000E+00	.612700E-02 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S821984	003628	A55	PU239	.124037 .000000E+00	.766500E-02 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S821991	003629	A55	PU239	.638300 .000000E+00	.391916E-01 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S821992	003630	A55	PU239	.682000E-01 .000000E+00	.419239E-02 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S821996	003631	A55	PU239	.682000E-01 .000000E+00	.419239E-02 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S821983	003632	A55	PU239	.310261 .000000E+00	.190500E-01 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S821982	003633	A55	PU239	.256515 .000000E+00	.157500E-01 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S821995	003634	A55	PU239	2.06800 .000000E+00	.126975 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S821993	003635	A55	PU239	.682000E-01 .000000E+00	.419239E-02 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S821994	003636	A55	PU239	.682000E-01 .000000E+00	.419239E-02 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S821201	003637	A61	PU52	52.0000 .000000E+00	3.70760 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S823198	003638	A61	PU52	52.0000 .000000E+00	3.70760 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S825748	003639	A61	PU52	52.0000 .000000E+00	3.70760 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S823000	003640	A31	PU52	52.0000 .000000E+00	3.70760 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S825749	003641	A61	PU52	53.0000 .000000E+00	3.77890 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S823151	003642	A61	PU52	52.0000 .000000E+00	3.70760 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S823096	012003	A52	PU42	25.0000 .000000E+00	4.52500 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S823097	012028	A52	PU42	20.0000 .000000E+00	3.62000 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S823098	012099	A52	PU42	20.0000 .000000E+00	3.62000 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S823095	012208	A52	PU42	20.0000 .000000E+00	3.62000 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00
S852053	003643	A31	PU54	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00	.000000E+00 .000000E+00

9851244	883644	A31	PU54								
9851245	883645	A31	PU42			PU54					
9851246	883646	A31	PU54								
9851247	883647	A36	PU54								
9851141	883648	A36	PU54								
9851142	883649	A38	PU54								
9851143	883650	A36	PU54								
9851144	883651	A36	PU56								
9851148	883652	A38	PU238			PU239					
9851145	883653	A38	PU238			PU239					
9851146	883654	A36	PU54								
9851147	883655	A38	PU54								
9851148	883656	A38	PU54								
9851149	883657	A36	PU54								
9851172	883660	A36	PU54								
9852046	883662	A38	PU56								
9852047	883663	A31	PU54								