UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION III
801 WARRENVILLE ROAD
LISLE, ILLINOIS 60532-4351

October 1, 2002

MEMORANDUM TO: Larry W. Camper, Chief
Decommissioning Branch
Division of Waste Management, NMSS

FROM: Christopher G. Miller, Chief
Decommissioning Branch, DNMS
Region III

SUBJECT: TECHNICAL ASSISTANCE REQUEST - ALLIANT TECHSYSTEMS, (ATK) ARDEN HILLS, MN (DOCKET NO. 04007982)

In an August 10, 2002 letter, ATK notified the NRC of its intent to ship approximately 22,000 cubic feet of decommissioning wastes to The Waste Control Specialists facility in Andrews, Texas. This licensee is currently authorized to decommission its former depleted uranium facilities under NRC License SUB-971.

Attached to the licensee's letter, are documents containing the data that has been gathered on the waste, and the calculations that have been done to justify that the waste meets the referenced requirements.

The licensee indicates that their request is consistent with 10 CFR Part 40 and Texas requirements. After discussion with Mr. Scott Moore, Chief, Special Projects, we are forwarding this request for your review and concurrence on the appropriateness of the licensee's request.

Should you have any questions or need further information, do not hesitate to contact me, or Mike McCann, ATK Project Manager, at (630) 829-9633, or (630) 829-9856.

Information in this record was deleted
in accordance with the Freedom of Information
Act, exemptions 4
FOIA- 2005-0393

COVER LETTER FOR TCAAP WASTE CHARACTERIZATION AND PACKAGING CALCULATIONS RELATED TO 10 CFR 40.13 EXEMPTION

To: Dr. James Persoon, ATK, Inc.

From: Safety and Ecology Corporation

Date: 29 July 2002

Subject: Cover Letter and Table of Contents for Exemption Proofs for TCAAP Wastes Destined for Waste Control Specialist, Andrews, Texas.

This letter is accompanied by the following hardcopy and or electronic data which support the requested exemption.

- Severn Trent Laboratory results, *SEC_Chem.pdf*
- Severn Trent Laboratory results, *SEC_IsoU.pdf*
- Nuclide % abundance calculations, *DU SpA3.xls*
- Ed Walker calculations *(DU Contaminated Waste Stream)*, dated 8/05/02, 11 pages
- TCAAP LLW Inventory Log, *_Rad Shipping Log.xls*, latest revision
- TCAAP Waste Calculations, *_Rad Shipping Log.xls*, current revision
- Waste Control Specialist Waste Acceptance Criteria, *WCS_WAC.rtf*, current revision
- WCS attachment to profile sheet, *WCSradcharacter.rtf*, current revision
- WCS Profile, *WCS_Profile.rtf*, current revision

One consideration outstanding is that all of the above are based on estimated volumes. The current LLW Inventory Log contains 227 packages with an average Specific activity that will only decrease with additional volume and weight. The materials of higher SpA have been packaged already and those over 0.5 mRem/hr contact will be treated as "Penetrator Like" material and processed through USE Inc in Oak Ridge, TN. Eleven (11) packages have a dose rate of > 0.25 mRem/hr and < 0.5 mRem/hr, those packages will be evaluated further. The remaining, as yet unpackaged, materials are assumed to be essentially <1 microRem/hr contact on each package. Additionally, the remaining material is of a much greater density than the first 400 yards in that it is concrete and soils instead of PPE and debris.

Please submit questions to Kent DeRoos, SEC waste engineer @ 865-251-2072.

Thank You.

Tel (651) 639-3331
Twin Cities Army Ammunition Plant
Building 502 MN 30-2520
Arden Hills, MN 55112

10 September 2002

Mr. Chris Miller
Branch Chief
U.S. Nuclear Regulatory Commission
Region III
801 Warrenville Road
Lisle, IL 60532

Dear Mr. Miller:

The purpose of this correspondence is to notify you of our intent to ship decommissioning waste from the Twin City Army Ammunition Plant (TCAAP) to the Waste Control Specialists facility in Andrews, Texas. We will produce an estimated 22,000 cubic feet of material from the decommissioning of the former Depleted Uranium manufacturing facility at TCAAP Building 502 (the DU Room). The material will contain on average, less than 150 pCi/g of depleted uranium. We have determined that Waste Control Specialists is an immediately viable, cost-effective alternative.

We intend to transfer our Nuclear Regulatory Commission licensed (SUB-971) material to Waste Control Specialists in accordance with the provisions of Title 10, Code of Federal Regulations, part 40.51(b)(4). Under State of Texas law, Waste Control Specialists can accept source material that meets the requirements for exempt material as defined in 25 Texas Administrative Code, Section 285.251(c)(1), which is the Texas Agreement State counterpart to Title 10, Code of Federal Regulations, part 40.13(a). We understand that, with respect to the transfer of a similar waste stream from the METCOA site (Pulaski, Pennsylvania), the Commission ruled that there are no specific Nuclear Regulatory Commission approval requirements. Furthermore, we understand that the Commission did not require the licensee to manifest the material in accordance with Title 10, Code of Federal Regulations, part 20.2006.

SEP 16

The attachments to this letter document the data that has been gathered on the subject waste and the calculations that have been done to justify that the waste meets the referenced requirement. Specifically, the attachments include:

1. A memo to me from Safety and Ecology Corporation that lists the supporting documentation for the exemption request.
2. Two sets of Severn Trent Laboratory results totaling 23 pages.
3. One page of specific activity calculations.
4. Eleven pages of DU Contaminated Waste Stream calculations by Ed Walker of SEC.
5. Six pages of the SEC TCAAP Waste Inventory Log.
6. Four pages of the SEC TCAAP Waste Calculations.
7. Eleven pages of the Waste Control Specialists Waste Acceptance Criteria.
8. Four pages of the WCS Waste Profile Sheet.
9. One page of the Attachment to the WCS Waste Profile Sheet.

The NRC license amendment for the decommissioning process of the TCAAP DU Room has been received and the decommissioning is proceeding on schedule. A prompt reply to this letter is requested since any delay in a disposition decision may jeopardize the completion of the project within the two-year timeframe specified by the Decommissioning Plan.

The point of contact is Dr. James R. Persoon, Radiation Safety Officer, (651) 639-3331, electronic mail address Jim_Persoon@atk.com.

Sincerely,

James R. Persoon

James R. Persoon, Ph.D.
Radiation Safety Officer
Alliant Techsystems Inc.

SAFETY & ECOLOGY CORPORATION

Client Sample ID: 1350-05-083206 DUP

Severn Trent Laboratories - Radiochemistry

Lab Sample ID: F2C070138-005X
Work Order: EV3RQ
Matrix: SOLID

Date Collected: 02/25/02 0704
Date Received: 03/06/02 0850

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	MDC	Prep Date	Analysis Date	Batch #	Yld %
Iso URANIUM (SHORT CT) NAS & DOE MOD				pCi/g	3050/RP-725			
Uranium 234	21300		4900	100	03/18/02	03/20/02	2077422	34
Uranium 235	3210		890	150	03/18/02	03/20/02	2077422	34
Uranium 238	177000		39000	100	03/18/02	03/20/02	2077422	34

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC

SAFETY & ECOLOGY CORPORATION

Client Sample ID: 1350-05-083206

Severn Trent Laboratories - Radiochemistry

Lab Sample ID: F2C070138-005
Work Order: EV3RQ
Matrix: SOLID

Date Collected: 02/25/02 0704
Date Received: 03/06/02 0850

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	MDC	Prep Date	Analysis Date	Batch #	Yld %
Iso URANIUM (SHORT CT) NAS & DOE MOD				pCi/g	3050/RP-725			
Uranium 234	23200		5400	200	03/18/02	03/20/02	2077422	31
Uranium 235	3540		980	160	03/18/02	03/20/02	2077422	31
Uranium 238	188000		43000	100	03/18/02	03/20/02	2077422	31

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC

METHOD BLANK REPORT

Severn Trent Laboratories - Radiochemistry

Client Lot ID: F2C070138
Matrix: SOLID

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	MDC	Prep Date	Analysis Date	Lab Sample ID Batch #	Yld %
Gamma Cs-137 & Hits by HASL 300 MOD			pCi/g	300 MOD			F2C110000-267B	
Cesium 137	0.0	J	0.0	0.0	03/11/02		2070267	
Iso URANIUM (SHORT CT) NAS & DOE MOD			pCi/g	3050/RP-725			F2C180000-422B	
Uranium 234	0.19	J	0.12	0.14	03/18/02	03/20/02	2077422	99
Uranium 235	0.044	U	0.074	0.15	03/18/02	03/20/02	2077422	99
Uranium 238	0.041	U	0.053	0.087	03/18/02	03/20/02	2077422	99

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined using instrument performance only
Bold results are greater than the MDC

J Result is greater than sample detection limit but less than stated reporting limit.
U Result is less than the sample detection limit.

DUPLICATE EVALUATION REPORT

Severn Trent Laboratories - Radiochemistry

Client Lot ID: F2C070138 Date Sampled: 02/25/02
Matrix: SOLID Date Received: 03/06/02

Parameter	SAMPLE Result	Total Uncert. (2σ +/-)	% Yld	DUPLICATE Result	Total Uncert. (2 σ +/-)	% Yld	QC Sample ID Precision	
Gamma Cs-137 & Hits by HASL 300 MOD			pCi/g	300 MOD			F2C070138-001	
Cesium 137	0.0 J	0.0		0.0 J	0.0		Erro	%RPD
Batch #:		2070267 (Sample)		2070267 (Duplicate)				
Iso URANIUM (SHORT CT) NAS & DOE MOD			pCi/g	3050/RP-725			F2C070138-005	
Uranium 234	23200	5400	31	21300	4900	34	9	%RPD
Uranium 235	3540	980	31	3210	890	34	10	%RPD
Uranium 238	188000	43000	31	177000	39000	34	6	%RPD
Batch #:		2077422 (Sample)		2077422 (Duplicate)				

NOTE(S)

Data are incomplete without the case narrative.
Calculations are performed before rounding to avoid round-off error in calculated results

J Result is greater than sample detection limit but less than stated reporting limit.
U Result is less than the sample detection limit.

Laboratory Control Sample Report

Severn Trent Laboratories - Radiochemistry

Client Lot ID: F2C070138
Matrix: SOLID

Parameter	Spike Amount	Result		Total Uncert. (2 σ+/-)	MDC	% Yld	% Rec	Lab Sample ID / QC Control Limits
Gamma Cs-137 & Hits by HASL 300 MOD			pCi/g		300 MOD			F2C110000-267C
Americium 241	0.0	0.0		0.0	0.0		****	(88 - 117)
Cesium 137	0.0	0.0	J	0.0	0.0		**** J	(84 - 112)
Cobalt 60	0.0	0.0		0.0	0.0		****	(89 - 106)
	Batch #:	2070267			Analysis Date:			
Iso URANIUM (SHORT CT) NAS & DOE MOD			pCi/g		3050/RP-725			F2C180000-422C
Uranium 234	2.65	2.93		0.69	0.07	101	110	(63 - 128)
Uranium 238	2.65	2.54		0.61	0.08	101	96	(63 - 128)
	Batch #:	2077422			Analysis Date:	03/20/02		

NOTE(S)

MDC is determined by instrument performance only
Calculations are performed before rounding to avoid round-off error in calculated results

J Result is greater than sample detection limit but less than stated reporting limit.

SEVERN TRENT SERVICES

STL St. Louis
13715 Rider Trail North
Earth City, MO 63045

Tel 314 298 8566
Fax 314 298 8757
www.stl-inc.com

ANALYTICAL REPORT

TCAAP

Lot #: F2C080156

Mark Kaye

SEC Business Center
2800 Solway Road
Knoxville, TN 37931

SEVERN TRENT LABORATORIES, INC.

John D. Powell
Project Manager

March 25, 2002

Case Narrative
LOT NUMBER: F2C080156

This report contains the analytical results for the three samples received under chain of custody by STL St. Louis on March 7, 2002. These samples are associated with your TCAAP project.

All applicable quality control procedures met method-specified acceptance criteria except as noted below.

This report is incomplete without the case narrative. All results are based upon sample as received, wet weight, unless noted otherwise.

Observations/Nonconformances

Reference the chain of custody and condition upon receipt report for any variations on receipt conditions and temperature of samples on receipt.

Affected Samples:
F2C080156 (4): 1350-08-083176

Affected Methods:
1311

Case Narrative:
TCLP non-volatiles preparation requires 100 grams of sample. There was insufficient sample provided to perform analysis at the method specified amount. A reduced sample amount was used.

METHODS SUMMARY

F2C080156

PARAMETER	ANALYTICAL METHOD	PREPARATION METHOD
pH Non-Aqueous	SW846 9045A	
Inductively Coupled Plasma (ICP) Metals	SW846 6010B	SW846 1311/3010
Mercury in Liquid Waste (Manual Cold-Vapor)	SW846 7470A	SW846 1311/7470
Volatile Organics by GC/MS	SW846 8260B	SW846 1311/5030

References:

SW846 "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 and its updates.

SAMPLE SUMMARY

F2C080156

WO #	SAMPLE#	CLIENT SAMPLE ID	SAMPLED DATE	SAMP TIME
EV5C4	001	1350-02-083236	02/25/02	19:0
EV5DC	003	1350-06-083196	02/25/02	19:0
EV5DG	004	1350-08-083176	02/25/02	19:0

NOTE(S):

- The analytical results of the samples listed above are presented on the following pages.
- All calculations are performed before rounding to avoid round-off errors in calculated results.
- Results noted as "ND" were not detected at or above the stated limit.
- This report must not be reproduced, except in full, without the written approval of the laboratory.
- Results for the following parameters are never reported on a dry weight basis: color, corrosivity, density, flashpoint, ignitability, layers, odor, paint filter test, pH, porosity pressure, reactivity, redox potential, specific gravity, spot tests, solids, solubility, temperature, viscosity, and weight.

SAFETY & ECOLOGY CORPORATION

Client Sample ID: 1350-02-083236

General Chemistry

Lot-Sample #...: F2C080156-001 Work Order #...: EV5C4 Matrix.....: SOLID
Date Sampled...: 02/25/02 19:01 Date Received..: 03/06/02
% Moisture.....:

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION-ANALYSIS DATE	PREP BATCH #
pH (solid)	12.4		No Units	SW846 9045A	03/13/02	2072478

Dilution Factor: 1 Analysis Time..: 00:00

SAFETY & ECOLOGY CORPORATION

Client Sample ID: 1350-06-083196

General Chemistry

Lot-Sample #...: F2C080156-003 Work Order #...: EV5DC Matrix.....: SOLID
Date Sampled...: 02/25/02 19:05 Date Received..: 03/06/02
% Moisture.....:

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION-ANALYSIS DATE	PREP BATCH #
pH (solid)	8.2		No Units	SW846 9045A	03/13/02	2072478

Dilution Factor: 1 Analysis Time..: 00:00

SAFETY & ECOLOGY CORPORATION

Client Sample ID: 1350-08-083176

TCLP GC/MS Volatiles

Lot-Sample #...:	F2C080156-004	Work Order #...:	EV5DG1AM	Matrix.....:	SOLID
Date Sampled...:	02/25/02 19:07	Date Received..:	03/06/02		
Leach Date.....:	03/11/02	Prep Date.....:	03/18/02	Analysis Date..:	03/18/02
Leach Batch #..:	P207003	Prep Batch #...:	2078121	Analysis Time..:	18:08
Dilution Factor:	1				
% Moisture.....:		Method.....:	SW846 8260B		

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Vinyl chloride	ND	100	ug/L
1,1-Dichloroethene	ND	50	ug/L
2-Butanone	ND	200	ug/L
Chloroform	ND	50	ug/L
Carbon tetrachloride	ND	50	ug/L
1,2-Dichloroethane	ND	50	ug/L
Benzene	ND	50	ug/L
Trichloroethene	ND	50	ug/L
Tetrachloroethene	ND	50	ug/L
Chlorobenzene	ND	50	ug/L

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Dibromofluoromethane	111	(83 - 125)
Toluene-d8	108	(87 - 116)
4-Bromofluorobenzene	105	(77 - 126)
1,2-Dichloroethane-d4	122	(81 - 136)

NOTE(S):

Analysis performed in accordance with USEPA Toxicity Characteristic Leaching Procedure Method 1311

SAFETY & ECOLOGY CORPORATION

Client Sample ID: 1350-08-083176

TCLP Metals

Lot-Sample #...: F2C080156-004 Matrix.....: SOLID
Date Sampled...: 02/25/02 19:07 Date Received..: 03/06/02
Leach Date.....: 03/11/02 Leach Batch #..: P207106

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 2073141						
Arsenic	4.1 B	500	ug/L	SW846 6010B	03/14-03/15/02	EV5DG1AC
		Dilution Factor: 2.5		Analysis Time..: 18:40		
Barium	178 B	500	ug/L	SW846 6010B	03/14-03/15/02	EV5DG1AI
		Dilution Factor: 2.5		Analysis Time..: 18:40		
Cadmium	81.2 B	125	ug/L	SW846 6010B	03/14-03/15/02	EV5DG1AF
		Dilution Factor: 2.5		Analysis Time..: 18:40		
Chromium	14.8 B	250	ug/L	SW846 6010B	03/14-03/15/02	EV5DG1AI
		Dilution Factor: 2.5		Analysis Time..: 18:40		
Lead	68.0 B	250	ug/L	SW846 6010B	03/14-03/15/02	EV5DG1A(
		Dilution Factor: 2.5		Analysis Time..: 18:40		
Silver	ND	250	ug/L	SW846 6010B	03/14-03/15/02	EV5DG1AI
		Dilution Factor: 2.5		Analysis Time..: 18:40		
Selenium	ND	500	ug/L	SW846 6010B	03/14-03/15/02	EV5DG1A:
		Dilution Factor: 2.5		Analysis Time..: 18:40		
Copper	5630	625	ug/L	SW846 6010B	03/14-03/15/02	EV5DG1A:
		Dilution Factor: 2.5		Analysis Time..: 18:40		
Zinc	18900	500	ug/L	SW846 6010B	03/14-03/15/02	EV5DG1A:
		Dilution Factor: 2.5		Analysis Time..: 18:40		
Prep Batch #...: 2074409						
Mercury	ND	1	ug/L	SW846 7470A	03/15-03/16/02	EV5DG1A:
		Dilution Factor: 5		Analysis Time..: 14:48		

NOTE(S):

Analysis performed in accordance with USEPA Toxicity Characteristic Leaching Procedure Method 1311

B Estimated result. Result is less than RL.

SAFETY & ECOLOGY CORPORATION

Client Sample ID: 1350-08-083176

General Chemistry

Lot-Sample #...: F2C080156-004 Work Order #...: EV5DG Matrix.....: SOLID
Date Sampled...: 02/25/02 19:07 Date Received..: 03/06/02
% Moisture.....:

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION-ANALYSIS DATE	PREP BATCH #
pH (solid)	8.0		No Units	SW846 9045A	03/13/02	2072478

Dilution Factor: 1 Analysis Time..: 00:00

METHOD BLANK REPORT

TCLP GC/MS Volatiles

Client Lot #...: F2C080156 Work Order #...: EV72P1AA Matrix.....: SOLID
MB Lot-Sample #: F2C110000-300
Leach Date.....: 03/11/02 Prep Date.....: 03/18/02 Analysis Date..: 03/18/02
Leach Batch #..: P207003 Prep Batch #...: 2078121 Analysis Time..: 17:32
Dilution Factor: 1

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD
Vinyl chloride	ND	100	ug/L	SW846 8260B
1,1-Dichloroethene	ND	50	ug/L	SW846 8260B
2-Butanone	ND	200	ug/L	SW846 8260B
Chloroform	ND	50	ug/L	SW846 8260B
Carbon tetrachloride	ND	50	ug/L	SW846 8260B
1,2-Dichloroethane	ND	50	ug/L	SW846 8260B
Benzene	ND	50	ug/L	SW846 8260B
Trichloroethene	ND	50	ug/L	SW846 8260B
Tetrachloroethene	ND	50	ug/L	SW846 8260B
Chlorobenzene	ND	50	ug/L	SW846 8260B

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Dibromofluoromethane	111	(83 - 125)
Toluene-d8	107	(87 - 116)
4-Bromofluorobenzene	108	(77 - 126)
1,2-Dichloroethane-d4	121	(81 - 136)

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

METHOD BLANK REPORT

GC/MS Volatiles

Client Lot #...: F2C080156 Work Order #...: EWJ751AA Matrix.....: SOLID
MB Lot-Sample #: F2C190000-121

Prep Date.....: 03/18/02 Analysis Time..: 16:20
Analysis Date..: 03/18/02 Prep Batch #...: 2078121
Dilution Factor: 1

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD
Vinyl chloride	ND	100	ug/L	SW846 8260B
1,1-Dichloroethene	ND	50	ug/L	SW846 8260B
2-Butanone	ND	200	ug/L	SW846 8260B
Chloroform	ND	50	ug/L	SW846 8260B
Carbon tetrachloride	ND	50	ug/L	SW846 8260B
1,2-Dichloroethane	ND	50	ug/L	SW846 8260B
Benzene	ND	50	ug/L	SW846 8260B
Trichloroethene	ND	50	ug/L	SW846 8260B
Tetrachloroethene	ND	50	ug/L	SW846 8260B
Chlorobenzene	ND	50	ug/L	SW846 8260B

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Dibromofluoromethane	107	(83 - 125)
Toluene-d8	103	(87 - 116)
4-Bromofluorobenzene	101	(77 - 126)
1,2-Dichloroethane-d4	116	(81 - 136)

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

METHOD BLANK REPORT

TCLP Metals

Client Lot #...: F2C080156 Matrix.....: SOLID

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
MB Lot-Sample #: F2C120000-298 Prep Batch #...: 2073141						
Leach Date.....: 03/11/02 Leach Batch #..: P207106						
Arsenic	5.2 B	500	ug/L	SW846 6010B	03/14-03/15/02	EV9DC1A
		Dilution Factor: 2.5				
		Analysis Time..: 18:29				
Barium	ND	500	ug/L	SW846 6010B	03/14-03/15/02	EV9DC1A
		Dilution Factor: 2.5				
		Analysis Time..: 18:29				
Cadmium	2.6 B	125	ug/L	SW846 6010B	03/14-03/15/02	EV9DC1A
		Dilution Factor: 2.5				
		Analysis Time..: 18:29				
Chromium	ND	250	ug/L	SW846 6010B	03/14-03/15/02	EV9DC1A
		Dilution Factor: 2.5				
		Analysis Time..: 18:29				
Lead	9.3 B	250	ug/L	SW846 6010B	03/14-03/15/02	EV9DC1A
		Dilution Factor: 2.5				
		Analysis Time..: 18:29				
Silver	ND	250	ug/L	SW846 6010B	03/14-03/15/02	EV9DC1A
		Dilution Factor: 2.5				
		Analysis Time..: 18:29				
Selenium	10.9 B	500	ug/L	SW846 6010B	03/14-03/15/02	EV9DC1A
		Dilution Factor: 2.5				
		Analysis Time..: 18:29				
Copper	ND	625	ug/L	SW846 6010B	03/14-03/15/02	EV9DC1A
		Dilution Factor: 2.5				
		Analysis Time..: 18:29				
Zinc	22.3 B	500	ug/L	SW846 6010B	03/14-03/15/02	EV9DC1
		Dilution Factor: 2.5				
		Analysis Time..: 18:29				
MB Lot-Sample #: F2C120000-298 Prep Batch #...: 2074409						
Leach Date.....: 03/11/02 Leach Batch #..: P207106						
Mercury	ND B	10	ug/L	SW846 7470A	03/15-03/16/02	EV9DC1
		Dilution Factor: 5				
		Analysis Time..: 14:41				

(Continued on next page)

METHOD BLANK REPORT

TCLP Metals

Client Lot #...: F2C080156 Matrix.....: SOLID

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

B Estimated result. Result is less than RL.

LABORATORY CONTROL SAMPLE EVALUATION REPORT

GC/MS Volatiles

Client Lot #...: F2C080156 Work Order #...: EWJ751AC Matrix.....: SOLID
LCS Lot-Sample#: F2C190000-121
Prep Date.....: 03/18/02 Analysis Date..: 03/18/02
Prep Batch #...: 2078121 Analysis Time..: 16:56
Dilution Factor: 1

PARAMETER	PERCENT RECOVERY	RECOVERY LIMITS	METHOD
Vinyl chloride	117	(10 - 150)	SW846 8260B
1,1-Dichloroethene	106	(73 - 150)	SW846 8260B
2-Butanone	105	(64 - 159)	SW846 8260B
Chloroform	106	(90 - 122)	SW846 8260B
Carbon tetrachloride	95	(85 - 126)	SW846 8260B
1,2-Dichloroethane	97	(83 - 130)	SW846 8260B
Benzene	106	(90 - 111)	SW846 8260B
Trichloroethene	93	(87 - 107)	SW846 8260B
Tetrachloroethene	81	(59 - 104)	SW846 8260B
Chlorobenzene	103	(90 - 114)	SW846 8260B

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Dibromofluoromethane	97	(90 - 114)
Toluene-d8	103	(89 - 117)
4-Bromofluorobenzene	109	(72 - 126)
1,2-Dichloroethane-d4	105	(77 - 132)

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

Bold print denotes control parameters

LABORATORY CONTROL SAMPLE EVALUATION REPORT

TCLP Metals

Lot-Sample #...: F2C080156 Matrix.....: SOLID

PARAMETER	PERCENT RECOVERY	RECOVERY LIMITS	RPD	RPD LIMITS	METHOD	PREPARATION-ANALYSIS DATE	PREP-BATCH #
Arsenic	106	(80 - 120)			SW846 6010B	03/14-03/15/02	2073141
	105	(80 - 120)	0.36	(0-20)	SW846 6010B	03/14-03/15/02	2073141
		Dilution Factor: 2.5					
Barium	104	(80 - 120)			SW846 6010B	03/14-03/15/02	2073141
	104	(80 - 120)	0.25	(0-20)	SW846 6010B	03/14-03/15/02	2073141
		Dilution Factor: 2.5					
Cadmium	93	(80 - 120)			SW846 6010B	03/14-03/15/02	2073141
	91	(80 - 120)	2.4	(0-20)	SW846 6010B	03/14-03/15/02	2073141
		Dilution Factor: 2.5					
Chromium	91	(80 - 120)			SW846 6010B	03/14-03/15/02	2073141
	89	(80 - 120)	2.4	(0-20)	SW846 6010B	03/14-03/15/02	2073141
		Dilution Factor: 2.5					
Lead	91	(80 - 120)			SW846 6010B	03/14-03/15/02	2073141
	90	(80 - 120)	1.6	(0-20)	SW846 6010B	03/14-03/15/02	2073141
		Dilution Factor: 2.5					
Silver	104	(49 - 135)			SW846 6010B	03/14-03/15/02	2073141
	103	(49 - 135)	0.80	(0-20)	SW846 6010B	03/14-03/15/02	2073141
		Dilution Factor: 2.5					
Selenium	109	(80 - 120)			SW846 6010B	03/14-03/15/02	2073141
	109	(80 - 120)	0.03	(0-20)	SW846 6010B	03/14-03/15/02	2073141
		Dilution Factor: 2.5					
Copper	111	(80 - 120)			SW846 6010B	03/14-03/15/02	2073141
	111	(80 - 120)	0.44	(0-20)	SW846 6010B	03/14-03/15/02	2073141
		Dilution Factor: 2.5					
Zinc	103	(80 - 120)			SW846 6010B	03/14-03/15/02	2073141
	101	(80 - 120)	2.1	(0-20)	SW846 6010B	03/14-03/15/02	2073141
		Dilution Factor: 2.5					
Mercury	88	(80 - 120)			SW846 7470A	03/15-03/16/02	2074409
	99	(80 - 120)	12	(0-20)	SW846 7470A	03/15-03/16/02	2074409
		Dilution Factor: 5					

(Continued on next page)

LABORATORY CONTROL SAMPLE EVALUATION REPORT

TCLP Metals

Lot-Sample #...: F2C080156 Matrix.....: SOLID

PARAMETER	PERCENT RECOVERY	RECOVERY LIMITS	RPD	RPD LIMITS	METHOD	PREPARATION-ANALYSIS DATE	PREP-BATCH #

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

LABORATORY CONTROL SAMPLE EVALUATION REPORT

General Chemistry

Client Lot #...: F2C080156 Matrix.....: SOLID

PARAMETER	PERCENT RECOVERY	RECOVERY LIMITS	METHOD	PREPARATION-ANALYSIS DATE	PREP BATCH #
pH (solid)		Work Order #: EWC2Q1AA	LCS Lot-Sample#: F2C130000-478		
	100	(99 - 101)	SW846 9045A	03/13/02	2072478
		Dilution Factor: 1			
		Analysis Time..: 00:00			

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

MATRIX SPIKE SAMPLE EVALUATION REPORT

TCLP GC/MS Volatiles

Client Lot #...: F2C080156 Work Order #...: EVX031AR-MS Matrix.....: SOLID
MS Lot-Sample #: F2C050227-001 EVX031AT-MSD
Date Sampled...: 02/20/02 09:00 Date Received..: 03/05/02
Leach Date.....: 03/11/02 Prep Date.....: 03/18/02 Analysis Date..: 03/18/02
Leach Batch #..: P207003 Prep Batch #...: 2078121 Analysis Time..: 19:19
Dilution Factor: 1

PARAMETER	PERCENT RECOVERY	RECOVERY LIMITS	RPD	RPD LIMITS	METHOD
Vinyl chloride	117	(37 - 150)			SW846 8260B
	117	(37 - 150)	0.17	(0-19)	SW846 8260B
1,1-Dichloroethene	108	(79 - 139)			SW846 8260B
	109	(79 - 139)	0.33	(0-19)	SW846 8260B
2-Butanone	119	(53 - 147)			SW846 8260B
	120	(53 - 147)	1.3	(0-19)	SW846 8260B
Chloroform	112	(87 - 125)			SW846 8260B
	112	(87 - 125)	0.33	(0-19)	SW846 8260B
Carbon tetrachloride	98	(76 - 137)			SW846 8260B
	98	(76 - 137)	0.10	(0-19)	SW846 8260B
1,2-Dichloroethane	105	(79 - 142)			SW846 8260B
	106	(79 - 142)	0.64	(0-19)	SW846 8260B
Benzene	110	(85 - 118)			SW846 8260B
	110	(85 - 118)	0.16	(0-19)	SW846 8260B
Trichloroethene	95	(77 - 114)			SW846 8260B
	95	(77 - 114)	0.75	(0-19)	SW846 8260B
Tetrachloroethene	80	(47 - 110)			SW846 8260B
	80	(47 - 110)	0.95	(0-19)	SW846 8260B
Chlorobenzene	106	(88 - 117)			SW846 8260B
	108	(88 - 117)	2.6	(0-19)	SW846 8260B

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Dibromofluoromethane	103	(83 - 125)
	104	(83 - 125)
Toluene-d8	107	(87 - 116)
	110	(87 - 116)
4-Bromofluorobenzene	117	(77 - 126)
	114	(77 - 126)
1,2-Dichloroethane-d4	114	(81 - 136)
	114	(81 - 136)

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

Bold print denotes control parameters

Specific Activity Calculation

Formula 3.575E+05 divided by (A)*(T1/2)*(%) in units of Ci per gram

	T1/2 (yr)	Atomic Wgt	Activity-based % Abundance	Iso-specific SpA
U234	2.45E+05	234	0.108	6.24E-03
U235	7.03E+08	235	0.0165	2.16E-06
U238	4.47E+09	238	0.875	3.36E-07

Lake City

% abund

350000 pCi/gm

Assume 1 Ci source

	Activity % Abundance	Ci Iso Activity	Ci/g SpA	Iso Weight g	% Wt Abundance	
U234	0.108	0.15	6.24E-03	2.41E+01	9.69E-06	0.000969
U235	0.0165	0.019	2.16E-06	8.78E+03	3.54E-03	0.353792
U238	0.875	0.831	3.36E-07	2.47E+06	9.96E-01	99.64524
			Total Wt (g)	2.48E+06	1.00E+00	

Assume 1 g Source

	% Wt. Abundance	Wt. (g)	SpA	Activity Contribution	
U234	9.69E-06	9.69E-06	6.24E-03	6.04E-08	1.50E-01
U235	3.54E-03	3.54E-03	2.16E-06	7.66E-09	1.90E-02
U238	9.96E-01	9.96E-01	3.36E-07	3.35E-07	8.31E-01
	1.00E+00	1.00E+00		4.03E-07 Ci/g	

SPECIFIC ACTIVITY USING THE LCAAP ISOTOPIC RATIO -----> 402,946 pCi/g

CALCULATION SHEET

DATE

DESIGNED BY E/Walker DATE 7-30-02 CHECKED BY SHEET NO. 1

PROJECT ATK-TCAAP JOB NO. 1350

SUBJECT DU Contaminated Waste Stream CALCULATION NO. FILE NO.

1. Introduction -

The demolition of Bldg 502 Annex at TCAAP includes material & debris contaminated with low levels of depleted uranium. These materials are packaged in soft side containers (super-sacks) containing 2.5-3.0 YD^3 average volume. Each of the containers is logged with a package number, package weight, and surface dose rate. Based on the isotopic composition of the DU, as determined by laboratory analysis, the dose rate measurements may be converted to define the radiological characteristics of the waste

2. Isotopic Composition - TCAAP Depleted Uranium (DU)

Lab analysis : Severn Trent Labs - Radiochemistry

Sample ID	Isotope	Result	±2σ	Units	Activity %
1350-05-083206	U-234	23200	5400	pCi/gm$	10.8
	U-235	3540	980	↓	1.6
	U-238	188,000	43,000	↓	87.5
1350-05-083206(DUP)	U-234	21,300	4900	pCi/gm$	10.6
	U-235	3210	890	↓	1.6
	U-238	177,000	39,000	↓	87.8

CALCULATION SHEET

DATE

ESIGNED BY S/Walker DATE 8-4-02 CHECKED BY SHEET NO. 2

ROJECT ATK-TCAAP JOB NO. 1350

UBJECT DU CONTAMINATED WASTE STREAM CALCULATION NO. FILE NO.

3. DEPLETED URANIUM GAMMA SOURCE ACTIVITY

Isotope (Uranium)	Isotope (Daughter)	Energy (MeV/γ)	Emission Rate (γ/dis U*) (Ref 1)	Isotopic Abundance (dis U*/dis U^T)	Yγ (γ/dis U^T)	(μ/ρ)_AIR (cm²/gm) (Ref 2)	Kγ (μR/hr/φγ)
U-234	—	No Gammas		0.108	—		
U-235	Th-231	0.084	0.064	0.016	0.00102	0.0242	0.140
		0.090	0.027		0.00043	0.0235	0.145
		0.094	0.045		0.00072	0.0232	0.150
		0.105	0.021		0.00034	0.0222	0.160
		0.109	0.015		0.00024	0.0225	0.169
		0.144	0.105		0.00168	0.0235	0.233
		0.163	0.047		0.00075	0.0245	0.264
		0.184	0.540		.00864	0.0255	0.323
		0.202	0.100		0.00160	0.0262	0.364
		0.205	0.047		0.00075	0.0263	0.371
	Pa-231	0.284	0.016		0.00026	0.0275	0.537
		0.301	0.046		0.00074	0.0282	0.583
		0.330	0.013		0.00021	0.0288	0.653
U-238	Th-234	0.063	0.038	0.876	0.03329	0.038	0.142
		0.093	0.054		0.04730	0.0233	0.149
	Pa-234m	0.097	0.002		0.00175	0.0225	0.150
		0.766	0.00207		0.00181	0.0292	1.537
		1.001	0.00589		0.00516	0.0275	1.892

$$K_\gamma\left(\frac{\mu Rad/hr}{\gamma/cm^2\text{-}s}\right) = (57.6)\,E_\gamma\left(\frac{\mu}{\rho}\right)_{AIR}$$ WHERE: 1 RAD = 100 erg/gm

$$K_\gamma\left(\frac{\mu R/hr}{\gamma/cm^2\text{-}s}\right) = (68.7)\,E_\gamma\left(\frac{\mu}{\rho}\right)_{AIR}$$ WHERE: 1 ROENTGEN = 83.8 erg/gm AIR

$\phi_\gamma = \gamma/cm^2\text{-}s$

CALCULATION SHEET

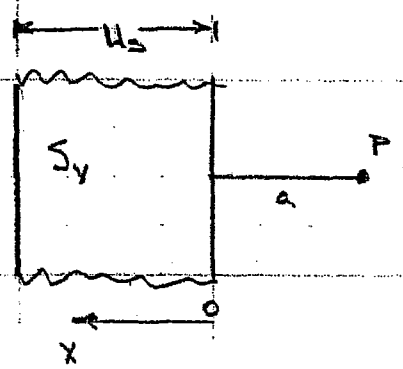
DATE

DESIGNED BY E/ Walters DATE 7-30-02 CHECKED BY SHEET NO. 3

PROJECT ATK- TCAAP JOB NO. 1350

SUBJECT DU CONTAMINATED WASTE STREAM CALCULATION NO. FILE NO.

4. GAMMA SOURCE - DOSE RATE RELATIONSHIP - VOLUME SOURCE



THE GAMMA DOSE RATE AT POINT P AT A DISTANCE a FROM THE SURFACE OF A VOLUMETRIC SOURCE IS PROPORTIONAL TO THE GAMMA FLUX (ϕ_γ) AT POINT P.

$$D_p\left(\frac{\mu R}{hr}\right) = K_\gamma\left(\frac{\mu R/hr}{\gamma/cm^2\text{-}s}\right) * \phi_p\left(\frac{\gamma}{cm^2\text{-}s}\right)$$

THE GAMMA FLUX AT POINT p IS RELATED TO THE VOLUMETRIC SOURCE TERM WITH THE RELATIONSHIP

$$\phi_p = B\left(\frac{S_v}{2\mu_s}\right)\left[E_2(b_1) - E_2(b_s)\right]$$

WHERE: ϕ_p - GAMMA FLUX AT POINT p ($\gamma/cm^2\text{-}s$)

S_v - VOLUMETRIC SOURCE TERM ($\gamma/cm^3\text{-}s$)

μ_s - GAMMA ATTENUATION IN SOURCE MEDIUM (cm^{-1})

$E_2(b_1)$ - IS AN EMIRICAL RELATIONSHIP THAT IS A FUNCTION OF SOURCE GEOMETRY, SHIELD GEOMETRY, AN DOSE POINT DISTANC

B - BUILDUP FACTOR IN SHIELD MATERIAL

IF DOSE POINT IS ON SURFACE OF SOURCE ($a = 0$), AND THERE IS NO EXTERNAL SHIELDING:

$$\phi_0 = \frac{S_v}{2\mu_s}\left[E_2(0) - E_2(\mu_s H_s)\right]$$

CALCULATION SHEET

DATE

DESIGNED BY S/Walker DATE 8-4-02 CHECKED BY SHEET NO. 4

PROJECT ATK-TCAAP JOB NO.

SUBJECT DU CONTAMINATED WASTE STREAM CALCULATION NO. FILE NO.

FOR AN SOURCE THICKNESS THAT IS LARGE COMPARED TO THE MEAN FREE PATH OF THE GAMMA $(\lambda = 1/\mu_s)_s$ THE TERM $E_2(\mu_s H)$ WILL TEND TO ZERO (0.0) AND $E_2(0)$ IS EQUAL TO 1.0. THE RESULTING RELATIONSHIP BETWEEN GAMMA FLUX (ϕ_γ) AND VOLUMETRIC SOURCE STRENGTH IS

$$\phi_\gamma = \frac{S_v}{2\mu_s}$$

THE TCAAP VOLUMETRIC SOURCE TERM IS TO BE DERIVED IN UNITS OF pCi/gm TO FACILITATE COMPARISON WITH TRANSPORT AND DISPOSAL REGULATIONS. THE RELATIONSHIP BETWEEN GAMMA FLUX AT THE SURFACE OF THE WASTE PACKAGE AND THE VOLUMETRIC SOURCE TERM IN UNITS OF ACTIVITY PER UNIT MASS IS DERIVED FROM :

$$\phi_\gamma\left(\frac{\gamma}{cm^2\text{-}s}\right) = \frac{S_v\,(pCi/gm)\,\rho_s\left(\frac{gm}{cm^3}\right)3.7\times10^{-2}\left(\frac{dis/s}{pCi}\right)\eta_\gamma\left(\frac{\gamma}{dis}\right)}{2\,\mu_s\,(cm^{-1})}$$

$$D_\gamma\left(\frac{mR}{hr}\right) = \phi_\gamma\left(\frac{\gamma}{cm^2\text{-}s}\right)K_\gamma\left(\frac{mR/hr}{\gamma/cm^2\text{-}s}\right)$$

$$\therefore\ D_\gamma\left(\frac{pCi}{gm}\right)_i = \frac{(3.7\times10^{-2})\,S_v}{2}\left[k_\gamma(i)\,\eta_\gamma(i)\Big/\left(\frac{\mu_s}{\rho_s}\right)_i\right]$$

$$= 1.85\times10^{-2}\,S_v\left[\frac{K_\gamma\,\eta_\gamma}{(\mu/\rho)_s}\right]_i$$

FOR HIGHEST ACTIVITY IN CONTAMINATED SLUDGES AND CONCRETE, USE ATTENUATION COEFFICIENTS FOR ALUMINUM

CALCULATION SHEET

DATE

ESIGNED BY S/Walker DATE 8-4-02 CHECKED BY SHEET NO. 5

ROJECT ATK-TCAAP JOB NO. 1350

UBJECT DU Contaminated Waste Stream CALCULATION NO. FILE NO.

GAMMA (i)	$E_\gamma(i)$ (MeV)	$n_\gamma(i)$ (γ/dis U)	$K_\gamma(i)$ $(\mu R/hr)/\phi_i$	$(\mu/\rho)_s$ (cm^2/gm)	$D_\gamma(i)/S_V$
1	0.084	0.00102	0.140	0.057	4.84×10^{-5}
2	0.090	0.00043	0.145	0.052	2.22×10^{-5}
3	0.094	0.00072	0.150	0.048	4.16×10^{-5}
4	0.105	0.00034	0.160	0.0425	2.37×10^{-5}
5	0.109	0.00024	0.169	0.0405	1.85×10^{-5}
6	0.144	0.00168	0.233	0.0335	2.16×10^{-4}
7	0.163	0.00075	0.264	0.0315	1.16×10^{-4}
8	0.184	0.00864	0.323	0.0305	1.69×10^{-3}
9	0.202	0.00160	0.364	0.0302	3.57×10^{-4}
10	0.205	0.00075	0.371	0.0300	1.72×10^{-4}
11	0.284	0.00026	0.537	0.0288	8.97×10^{-5}
12	0.301	0.00074	0.583	0.0287	2.78×10^{-4}
13	0.330	0.00021	0.653	0.0286	8.87×10^{-5}
					(3.16×10^{-3})
14	0.063	0.03329	0.142	0.113	7.74×10^{-4}
15	0.093	0.04730	0.149	0.0475	2.75×10^{-3}
16	0.097	0.00175	0.150	0.0465	1.04×10^{-4}
17	0.766	0.00181	1.537	0.0283	1.82×10^{-3}
18	1.001	0.00516	1.892	0.0270	6.69×10^{-3}
					(1.213×10^{-2})

$$\sum_i D_\gamma(i)/S_V = 1.529\times10^{-2}\left(\frac{\mu R/hr}{pCi/gm}\right)$$

$$\therefore S_V\left(pCi/gm\right)_T = (65.4)\,D_\gamma\left(\frac{\mu R}{hr}\right)$$

CALCULATION SHEET

DATE _____

DESIGNED BY S. Walker DATE 8-5-02 CHECKED BY _____ SHEET NO. 6

PROJECT ATK-TCAAP JOB NO. _____

SUBJECT DU CONTAMINATED WASTE STREAM CALCULATION NO. _____ FILE NO. _____

BREMSSTRAHLUNG

THE Pa-234m EQUILIBRIUM DAUGHTER DECAYS WITH A 2.28 MeV BETA WITH AN ABUNDANCE OF 0.986 PER DISINTEGRATION. THIS BETA WILL PRODUCE X-RAY (BREMSSTRAHLUNG) WITH AN EFFECTIVE ENERGY THAT IS A FUNCTION OF THE BETA PARTICLE AND THE ATOMIC NUMBER (Z) OF THE MATRIX CONTAINING THE BETA EMITTER.

$$E_{AV} = 1.23 \times 10^{-4} (\bar{Z} + 3) E_\beta^2 \quad (\text{MeV/BETA})$$ REF 3

FOR THE WASTE MATRIX, ASSUME ALUMINUM (FOR SOIL, CONCRETE, SLUDGES, ETC) : Z = 13

$$E_{AVG} = (1.23 \times 10^{-4})(13 + 3)(2.28)^2$$

$$= 1.023 \times 10^{-2} \text{ MeV/BETA}$$

BREMSSTRAHLUNG SPECTRUM : $E_\beta = 2.28$

Energy Interval Fraction	Energy Interval (MeV)	Interval Avg Energy (MeV)	Photon Fraction (f_γ)	Energy Conversion (MeV/β)	Dose Conversion - Air $(\mu/\rho)_a$ (cm²/g m)	K_e (μR/hr / MeV/g m²/s)	K_γ ((μR/hr) / β/cm²-s)
0.0-0.1	0 - .228	0.114	0.435	4.45×10^{-2}	0.0225	1.547	6.884×10^{-3}
0.1-0.2	.228-.456	0.342	0.258	2.64×10^{-2}	0.0292	2.007	5.297×10^{-3}
0.2-0.3	.456-.684	0.570	0.152	1.56×10^{-3}	0.0292	2.007	3.121×10^{-3}
0.3-0.4	.684-.912	0.798	0.083	8.49×10^{-4}	0.0285	1.959	1.663×10^{-3}
0.4-0.5	.912-1.140	1.026	0.043	4.39×10^{-4}	0.0272	1.870	8.226×10^{-4}
0.5-0.6	1.14-1.368	1.254	0.020	2.05×10^{-4}	0.0260	1.787	3.656×10^{-4}

CALCULATION SHEET

DATE

DESIGNED BY S/Walker DATE 8-1-02 CHECKED BY SHEET NO. 7

PROJECT ATK-TCAAP JOB NO.

SUBJECT DU Contaminated Waste Stream CALCULATION NO. FILE NO.

THE GAMMA DOSE FROM THE BREMSSTRAHLUNG FROM BETA ACTIVITY INSIDE THE WASTE MATRIX WILL BE

$$D_\gamma\left(\frac{\mu R}{hr}\right) = \frac{S_V\left(\frac{pCi}{gm}\right)\rho_s\left(\frac{gm}{cm^3}\right)3.7\times10^{-2}\left(\frac{dis}{s-pCi}\right)\xi_\beta\left(\frac{\beta}{dis}\right)E_{AVG}\left(\frac{MeV}{Beta}\right)K_e\left(\frac{\mu R/hr}{MeV/cm^2\text{-}s}\right)}{2\,\mu_s\,(cm^{-1})}$$

LET $K_\gamma\left(\frac{\mu R/hr}{\beta/cm^2\text{-}s}\right) = f_\gamma E_{AVG}\left(\frac{MeV}{\beta}\right)K_e\left(\frac{\mu R/hr}{MeV/cm^2\text{-}s}\right)$

FOR EACH BREMSSTRAHLUNG ENERGY INTERVAL (j) THE EFFECTIVE DOSE CONSTANT $D_\gamma(j)$ WILL BE

$$D_\gamma(j) = \frac{(3.7\times10^{-2})(.986)}{2}S_V\left[K_\gamma(j)\Big/\left(\frac{\mu}{\rho_s}\right)_j\right]$$

$$= 1.824\times10^{-2}\,S_V\left[K_\gamma\Big/\left(\frac{\mu}{\rho}\right)_s\right]_j \qquad \text{WHERE } S_V = \frac{pCi - U^{238}}{gm\ WASTE}$$

AS PREVIOUSLY NOTED, THE ACTIVITY FRACTION OF U-238 IN THE DEPLETED URANIUM IS 0.876. THIS WILL ADJUST THE CORRESPONDING BREMSSTRAHLUNG DOSE CONVERSION BY

$$D_\gamma(j) = 1.598\times10^{-2}\,S_V\left[K_\gamma\Big/\frac{\mu}{\rho_s}\right]_j \qquad S_V = \frac{pCi - DU}{gm\ WASTE}$$

$$D_\gamma(j)/S_V = 1.598\times10^{-2}\,\frac{(K_\gamma)_j}{(\mu/\rho_s)_j}$$

BREMSSTRAHLUNG DOSE RATE FROM DU IN WASTE

$$D_\gamma/S_V = \sum_j D_\gamma(j)/S_V$$

CALCULATION SHEET

DATE

DESIGNED BY Z/Walker DATE 8-5-02 CHECKED BY SHEET NO. 8

PROJECT ATK-TCAAP JOB NO.

SUBJECT DU CONTAMINATED WASTE STREAM CALCULATION NO. FILE NO.

Brem Internal Avg Energy (MeV)	μ/ρ-waste (cm^2/gm) (1)	K_γ ($\frac{\mu R/hr}{g/cm^2\text{-}s}$)	$D_\gamma(i)/S_V$ ($\frac{\mu R/hr}{pCi\text{-}DU\text{-}gm}$)
0.114	0.0385	4.884×10^{-3}	2.857×10^{-2}
0.342	0.0286	5.297×10^{-3}	2.960×10^{-3}
0.570	0.0288	3.121×10^{-3}	1.737×10^{-3}
0.798	0.0280	1.663×10^{-3}	9.522×10^{-4}
1.026	0.0266	8.226×10^{-4}	5.171×10^{-4}
1.254	0.0255	3.656×10^{-4}	2.298×10^{-4}
1.482	0.0242	1.221×10^{-4}	8.06×10^{-5}

(1) ASSUMED FOR $\bar{Z}$ EQUIVALENT TO ALUMINUM ($Z = 13$)

$$\sum_i D_\gamma(i)/S_V = 9.367\times10^{-3}$$

ADDING THIS VALUE TO THE DIRECT DOSE CONVERSIONS FOR U-235 AND U-238

1) U-235 $D_\gamma/S_V = 3.16\times10^{-3}$ $(\mu R/hr)/(pCi\text{-}DU/gm\text{-}Waste)$

2) U-238 $D_\gamma/S_V = 1.213\times10^{-2}$ $(\mu R/hr)/(pCi\text{-}DU/gm\text{-}Waste)$

3.) BREMSSTRAHLUNG $D_\gamma/S_V = 9.37\times10^{-3}$ $(\mu R/hr)/(pCi\text{-}DU/gm\text{-}Waste)$

TOTAL $D_\gamma/S_V = 2.466\times10^{-2}$ $(\mu R/hr)/(pCi\text{-}DU/gm\text{-}Waste)$

$$\therefore\ S_V\left(\frac{pCi\text{-}DU}{gm\text{-}Waste}\right) = (40.56)\,D_\gamma\left(\frac{\mu R}{hr}\right)$$

CALCULATION SHEET

DATE

DESIGNED BY S/Walker DATE 8-1-02 CHECKED BY SHEET NO. 9

PROJECT ATK-TCAAP JOB NO.

SUBJECT DU Contaminated Waste Stream CALCULATION NO. FILE NO.

6. DU Weight Fraction in Waste Stream

The source-to-dose conversion will result in an estimate of the uranium (U-235 + U-238) activity concentration in the waste stream. The U-234 activity, while significant, results in negligible mass addition due to it's greater specific activity (Ci/gm)

The source-to-dose conversion will result in an estimate of U-238 activity in the waste. Approximately 49.2 % of the gamma dose is from U-238 daughter activity and 12.8% is from U-235 decay. The remainder of the dose rate is from U-238 (Pa-234m) bremsstrahlung. The U-238 mass may be estimated from the fraction of the waste package dose rate that results from the U-238

$$S_\gamma \left(\frac{pCi\ U^{238}}{gm\ Waste} \right) = (40.56)(.492)\left(\frac{D_\gamma U^{238}}{D_\gamma U_T} \right) D_\gamma \left(\frac{\mu R}{hr} \right)_{TOTAL}$$

$$= 19.96\ D_\gamma \left(\frac{\mu R}{hr} \right)$$

Convert $pCi \cdot U^{238}$ to $gm\ U^{238}$ by specific activity

$$SpA\ (U^{238}) = 3.33 \times 10^{-5}\ \left(pCi \cdot U^{238} / gm\ U^{238} \right)$$

$$f_w \left(\frac{gm\ U^{238}}{gm\ Waste} \right) = \frac{S_\gamma\ (pCi\ U^{238} / gm\ Waste)}{SpA\ (pCi\ U^{238} / gm\ U^{238})}$$

$$= (5.99 \times 10^{-5})\ D_\gamma \left(\frac{\mu R}{hr} \right)$$

CALCULATION SHEET

DATE

DESIGNED BY S/Walker DATE 8-1-02 CHECKED BY SHEET NO. 10

PROJECT ATK / TCAAP JOB NO.

SUBJECT DU Contaminated Waste Stream CALCULATION NO. FILE NO.

THE MASS OF U-238 IN EACH WASTE PACKAGE IS THE PRODUCT OF THE WEIGHT FRACTION (f_w) AND THE TOTAL WEIGHT OF THE PACKAGE. THE RELATIONSHIP BETWEEN AVERAGE PACKAGE DOSE RATE AND U-238 MASS CONTENT IS:

$$M_i\,(gm\text{-}U^{238}) = (5.99\times10^{-5})\,D_\gamma\left(\frac{mR}{hr}\right)\,W_i\,(\text{Total Weight-}gm)$$

THE MASS OF U-235 IN EACH WASTE PACKAGE IS FOUND FROM THE APPARENT ENRICHMENT OF THE DU. THIS MAY BE FOUND FROM THE ACTIVITY CONCENTRATIONS REPORTED FROM THE SAMPLE ANALYSIS BY SEVERN TRENT, AND THE SPECIFIC ACTIVITY OF THE URANIUM ISOTOPES

LAB ANALYSIS - SEVERN TRENT RADIOCHEMISTRY

Isotope (i)	Sample Content (pCi-i/gm sample)	Specific Activity (pCi-i/gm-i)	Weight Fraction (gm-i/gm-sample)
234	2.32×10^{4}	6.16×10^{9}	3.77×10^{-6}
235	3.54×10^{3}	2.14×10^{6}	1.654×10^{-3}
238	1.88×10^{5}	3.33×10^{5}	5.646×10^{-1}
Total U			5.662×10^{-1}

$$\text{U-235 Fraction} = \frac{M(U235)}{M(U)} = \frac{(1.654\times10^{-3})\ gm\,U234/gm\,S}{(5.662\times10^{-1})\ gm\,U/gm\,S}$$

$$= 2.92\times10^{-3}\ gm\,U235/gm\,U$$

$$= 0.00292$$

CALCULATION SHEET

DATE

DESIGNED BY S/Wallace DATE 8-1-02 CHECKED BY SHEET NO. 11

PROJECT ATK - TCAAP JOB NO.

SUBJECT DU CONTAMINATED WASTE STREAM CALCULATION NO. FILE NO.

THE MASS OF U-235 IN EACH PACKAGE MAY BE ESTIMATED FROM THE U-238 AND THE MASS RATIO OF U-235 TO U-238

$$MR(U\text{-}235) = \frac{(1.654 \times 10^{-3})\ gm\ U235 / gm\ S}{(5.646 \times 10^{-1})\ gm\ U^{238} / gm\ S}$$

$$= 0.00293\ gm\ U235 / gm\ U238$$

$$M_i(gm\ U235) = (0.00293)\ \frac{gm\ U235}{gm\ U^{238}}\ (M_i)\ U238$$

$$= (2.93 \times 10^{-3})(5.99 \times 10^{-5})\ D_{\gamma i} * W_i$$

$$= (1.756 \times 10^{-7})\ D_\gamma * W_i$$

PER 10CFR40.13, UNIMPORTANT QUANTITIES OF SOURCE MATERIAL ARE DEFINED AS ANY FORM IN WHICH SOURCE MATERIAL IS LESS THAN ONE-TWENTIETH OF 1 PERCENT (0.05%) BY WEIGHT OF THE MIXTURE OR COMPOUND.

TO DEMONSTRATE COMPLIANCE WITH THIS EXEMPTION, THE CHARACTERISTICS OF EACH WASTE PACKAGE ARE EVALUATED AND SUMMED FOR THE ENTIRE WASTE STREAM.

FOR EACH PACKAGE (i) - THE WEIGHT FRACTION IS:

$$f_W\ \text{TOTAL URANIUM} = \frac{M_i(U235) + M_i(U238)}{M_i(\text{PACKAGE})}$$

FOR THE WASTE STREAM

$$f_W(\text{TOTAL URANIUM}) = \frac{\sum_i (M_i\text{-}U235) + (M_i\text{-}U238)}{\sum_i M_i(\text{PACKAGE})} \leq 0.0005$$

TCAAP D&D Project
LLW Inventory Log

Container ID	Content/Size Code	Weight (LBS)			Dose Rate		Smears < 220 dpm/100cm2			Date			Survey		
		Gross *	Tare	Net	Contact	1 Meter	Top	Side	Bottom	Packed	Outdoors	Shipped	Number	Date	Surveyor
ATK-LL001	1A,2B,3B,4B	3240	36	3204	0.001	0.001	80	100	120	12/6/01	1/2/02		TDS-0001	12/10/01	Brian Hudson
ATK-LL002	1A,2B,3B,4B	2315	36	2279	0.012	0.001	0	72	0	12/10/01	1/2/02		TDS-0002	12/10/01	Brian Hudson
ATK-LL003	1A,2B,3B,4B	2662	36	2626	0.001	0.001	0	0	0	12/10/01	1/2/02		TDS-0002	12/10/01	Brian Hudson
ATK-LL004	1A,2B,3B,4B	3209	36	3173	0.001	0.001	0	0	0	12/11/01	1/2/02		TDS-0003	12/11/01	Patricia Giza
ATK-LL005	1A,2B,3B,4B	2484	36	2448	0.001	0.001	0	95	50	12/12/01	1/2/02		TDS-0004	12/12/01	Brian Hudson
ATK-LL006	1A,2B,3B,4B	3126	36	3090	0.001	0.001	41	45	27	12/12/01	1/2/02		TDS-0004	12/12/01	Brian Hudson
ATK-LL007	1A,2B,3B,4B	2578	36	2542	0.001	0.001	23	14	0	12/13/01	1/2/02		TDS-0005	12/13/01	Brian Hudson
ATK-LL008	1A,2B,3B,4B	4904	36	4868	0.001	0.001	1	0	0	12/17/01	1/2/02		TDS-0006	01/04/02	Michael Rennhack
ATK-LL009	1A,2B,3B,4B	3989	36	3953	0.002	0.001	0	0	0	12/18/01	1/2/02		TDS-0007	12/18/01	Brian Hudson
ATK-LL010	1A,2B,3B,4B	932	36	896	0.005	0.001	6	0	0	12/18/01	1/2/02		TDS-0007	12/18/01	Brian Hudson
ATK-LL011	1A,2B,3B,4B	2694	36	2658	0.022	0.002	8	0	0	12/19/01	1/2/02		TDS-0006	01/04/02	Michael Rennhack
ATK-LL012	1A,2B,3B,4B	2108	36	2072	0.011	0.005	17	21	3	12/20/01	1/2/02		TDS-0006	01/04/02	Michael Rennhack
ATK-LL013	1A,2B,3B,4B	1459	36	1423	0.350	0.032	14	10	0	12/20/01	1/2/02		TDS-0006	01/04/02	Michael Rennhack
ATK-LL014	1A,2B,3B,4B	2437	36	2401	0.200	0.001	22	7	0	1/2/02	1/21/02		TDS-0006	01/04/02	Michael Rennhack
ATK-LL015	1A,2B,3B,4B	1918	36	1882	0.030	0.002	23	5	4	1/3/02	1/21/02		TDS-0006	01/04/02	Michael Rennhack
ATK-LL016	1A,2B,3B,4B	3111	36	3075	0.010	0.003	32	20	5	1/4/02	1/21/02		TDS-0008	01/14/02	Michael Rennhack
ATK-LL017	1A,2B,3B,4B	1960	36	1924	0.100	0.012	2	5	1	1/4/02	1/21/02		TDS-0008	01/14/02	Michael Rennhack
ATK-LL018	1A,2B,3B,4B	1949	36	1913	0.060	0.010	11	3	7	1/7/02	1/21/02		TDS-0008	01/14/02	Michael Rennhack
ATK-LL019	1A,2B,3B,4B	1132	36	1096	0.030	0.006	14	3	11	1/7/02	1/21/02		TDS-0008	01/14/02	Michael Rennhack
ATK-LL020	1A,2B,3B,4B	2374	36	2338	0.008	0.001	30	0	11	1/8/02	1/21/02		TDS-0008	01/14/02	Michael Rennhack
ATK-LL021	1A,2B,3B,4B	1221	36	1185	0.004	0.001	0	15	0	1/14/02	1/21/02		TDS-0008	01/14/02	Michael Rennhack
ATK-LL022	1A,2B,3B,4B	2266	36	2230	0.001	0.001	0	0	0	1/15/02	1/21/02		TDS-0010	01/30/02	Michael Rennhack
ATK-LL023	1A,2B,3B,4B	1105	36	1069	0.001	0.001	1	1	1	1/15/02	1/21/02		TDS-0010	01/30/02	Michael Rennhack
ATK-LL024	1A,2B,3B,4B	1444	36	1408	0.004	0.001	5	5	0	1/16/02	1/21/02		TDS-0010	01/30/02	Michael Rennhack
ATK-LL025	1A,2B,3B,4B	1238	36	1202	0.001	0.001	35	9	1	1/16/02	1/21/02		TDS-0010	01/30/02	Michael Rennhack
ATK-LL026	1A,2B,3B,4B	1850	36	1814	0.001	0.001	12	5	5	1/16/02	1/21/02		TDS-0010	01/30/02	Michael Rennhack
ATK-LL027	1A,2B,3B,4B	2511	36	2475	0.004	0.001	9	1	1	1/17/02	1/21/02		TDS-0010	01/30/02	Michael Rennhack
ATK-LL028	1A,2B,3B,4B	1715	36	1679	0.250	0.022	0	23	10	1/17/02	1/21/02		TDS-0009	01/17/02	Brian Hudson
ATK-LL029	RQ-Asbestos	978	36	942	0.002	0.001	0	0	0	1/21/02	2/19/02		TDS-0011	01/30/02	Michael Rennhack
ATK-LL030	RQ-Asbestos	1348	36	1312	0.110	0.015	0	0	0	1/21/02	2/19/02		TDS-0011	01/30/02	Michael Rennhack
ATK-LL031	RQ-Asbestos	2396	36	2360	0.250	0.050	0	0	0	1/22/02	2/19/02		TDS-0011	01/30/02	Michael Rennhack
ATK-LL032	RQ-Asbestos	2058	36	2022	0.250	0.050	0	0	0	1/28/02	2/19/02		TDS-0011	01/30/02	Michael Rennhack
ATK-LL033	RQ-Asbestos	2725	36	2689	0.050	0.005	2	0	0	1/29/02	2/19/02		TDS-0011	01/30/02	Michael Rennhack
ATK-LL034	RQ-Asbestos	1904	36	1868	0.220	0.007	2	0	0	1/29/02	2/19/02		TDS-0011	01/30/02	Michael Rennhack
ATK-LL035	RQ-Asbestos	2470	36	2434	0.001	0.001	0	0	0	1/30/02	2/19/02		TDS-0012	02/12/02	Michael Rennhack
ATK-LL036	RQ-Asbestos	2346	36	2310	0.001	0.001	0	0	0	1/30/02	2/19/02		TDS-0012	02/12/02	Michael Rennhack
ATK-LL037	RQ-Asbestos	2880	36	2844	0.030	0.001	2	0	10	1/31/02	2/19/02		TDS-0013	01/31/02	Brian Hudson
ATK-LL038	RQ-Asbestos	2201	36	2165	0.004	0.001	0	0	0	2/12/02	2/19/02		TDS-0012	02/12/02	Michael Rennhack
ATK-LL039	RQ-Asbestos	2428	36	2392	0.004	0.001	0	0	0	2/12/02	2/19/02		TDS-0012	02/12/02	Michael Rennhack
ATK-LL040	RQ-Asbestos	2860	36	2824	0.015	0.001	0	4	0	2/12/02	2/19/02		TDS-0012	02/12/02	Michael Rennhack

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		Gross *	Tare	Net	Contact	1 Meter	Top	Side	Bottom	Packed	Outdoors	Shipped	Number	Date	Surveyor
ATK-LL041	RQ-Asbestos	2983	36	2947	0.004	0.001	0	0	0	2/12/02	2/19/02		TDS-0012	02/12/02	Michael Rennhack
ATK-LL042	RQ-Asbestos	2975	36	2939	0.020	0.001	0	0	0	2/12/02	2/19/02		TDS-0014	03/14/02	Michael Rennhack
ATK-LL043	RQ-Asbestos	3084	36	3048	0.002	0.001	3	3	3	2/13/02	2/19/02		TDS-0014	03/14/02	Michael Rennhack
ATK-LL044	RQ-Asbestos	1806	36	1770	0.005	0.001	0	0	0	2/14/02	2/19/02		TDS-0014	03/14/02	Michael Rennhack
ATK-LL045	RQ-Asbestos	1609	36	1573	0.004	0.001	2	3	0	2/21/02	3/5/02		TDS-0015	03/06/02	Mike Andrie
ATK-LL046	1A,2B,3B,4B	1263	36	1227	0.004	0.001	37	0	0	2/21/02	3/5/02		TDS-0015	03/06/02	Mike Andrie
ATK-LL047	1A,2B,3B,4B	1042	36	1006	0.070	0.006	14	3	22	2/28/02	3/5/02		TDS-0015	03/06/02	Mike Andrie
ATK-LL048	enetrator Barrel/S	665	41	624	4.000	0.200	18	0	10	2/28/02	N/A		TDS-0015	03/06/02	Mike Andrie
ATK-LL049	enetrator Barrel/S	561	41	520	4.000	0.200	12	0	16	2/28/02	N/A		TDS-0015	03/06/02	Mike Andrie
ATK-LL050	enetrator Barrel/S	602	41	561	4.000	0.200	33	10	0	2/28/02	N/A		TDS-0015	03/06/02	Mike Andrie
ATK-LL051	1C,4C,6D	1406	36	1370	0.020	0.001	10	10	0	3/5/02	3/5/02		TDS-0015	03/06/02	Mike Andrie
ATK-LL052	1A,4E,6C	1058	36	1022	0.060	0.020	32	0	9	3/6/02	4/5/02		TDS-0016	03/28/02	Michael Rennhack
ATK-LL053	1A,4E,6C	2082	36	2046	0.040	0.004	7	0	0	3/7/02	4/5/02		TDS-0016	03/28/02	Michael Rennhack
ATK-LL054	1C,4E,2C	2009	36	1973	0.003	0.001	13	0	1	3/11/02	4/5/02		TDS-0016	03/28/02	Michael Rennhack
ATK-LL055	1C,4E,2C	2448	36	2412	0.055	0.005	0	0	10	3/12/02	4/5/02		TDS-0016	03/28/02	Michael Rennhack
ATK-LL056	1A,2B,3B,4B	1230	36	1194	0.004	0.001	21	0	0	3/14/02	4/5/02		TDS-0014	03/14/02	Michael Rennhack
ATK-LL057	1A,2B,3B,4B	1222	36	1186	0.490	0.100	7	0	14	3/20/02	4/5/02		TDS-0016	03/28/02	Michael Rennhack
ATK-LL058	1A,2B,3B,4B	2135	36	2099	0.260	0.040	37	1	4	3/25/02	4/5/02		TDS-0016	03/28/02	Michael Rennhack
ATK-LL059	4E,4F	1504	36	1468	0.490	0.030	59	0	13	3/25/02	4/5/02		TDS-0017	03/28/02	Michael Rennhack
ATK-LL060	4E,4F	1151	36	1115	0.105	0.016	19	0	0	3/27/02	4/5/02		TDS-0017	03/28/02	Michael Rennhack
ATK-LL061	4E,4F	2271	36	2235	0.004	0.001	0	0	0	3/27/02	4/5/02		TDS-0017	03/28/02	Michael Rennhack
ATK-LL062	4E,4F	1125	36	1089	0.100	0.020	0	0	0	3/27/02	4/5/02		TDS-0017	03/28/02	Michael Rennhack
ATK-LL063	4E,4F	1180	36	1144	0.001	0.001	2	0	7	3/28/02	4/5/02		TDS-0017	03/28/02	Michael Rennhack
ATK-LL064	RQ-Asbestos	1341	36	1305	0.004	0.001	0	0	1	3/28/02	4/5/02		TDS-0017	03/28/02	Michael Rennhack
ATK-LL065	RQ-Asbestos	1149	36	1113	0.004	0.001	4	7	1	4/1/02	4/5/02		TDS-0018	04/02/02	Michael Rennhack
ATK-LL066	RQ-Asbestos	1010	36	974	0.300	0.040	14	2	7	4/1/02	4/5/02		TDS-0018	04/02/02	Michael Rennhack
ATK-LL067	RQ-Asbestos	845	36	809	0.400	0.100	0	2	0	4/1/02	4/5/02		TDS-0018	04/02/02	Michael Rennhack
ATK-LL068	RQ-Asbestos	1196	36	1160	0.200	0.040	16	11	0	4/1/02	4/5/02		TDS-0018	04/02/02	Michael Rennhack
ATK-LL069	RQ-Asbestos	1060	36	1024	0.001	0.001	13	0	10	4/1/02	4/5/02		TDS-0018	04/02/02	Michael Rennhack
ATK-LL070	RQ-Asbestos	735	36	699	0.001	0.001	6	0	1	4/1/02	4/5/02		TDS-0018	04/02/02	Michael Rennhack
ATK-LL071	Sheet Metal	1239	36	1203	0.004	0.001	0	10	1	4/2/02	4/5/02		TDS-0019	04/04/02	Mike Andrie
ATK-LL072	RQ-Asbestos	713	36	677	0.140	0.007	0	0	1	4/2/02	4/5/02		TDS-0019	04/04/02	Mike Andrie
ATK-LL073	RQ-Asbestos	970	36	934	0.380	0.140	0	0	1	4/2/02	4/5/02		TDS-0019	04/04/02	Mike Andrie
ATK-LL074	RQ-Asbestos	1343	36	1307	0.010	0.001	49	7	33	4/9/02	4/16/02		TDS-0020	04/10/02	Michael Rennhack
ATK-LL075	RQ-Asbestos	555	36	519	0.060	0.007	31	4	24	4/9/02	4/16/02		TDS-0020	04/10/02	Michael Rennhack
ATK-LL076	RQ-Asbestos	583	36	547	0.380	0.060	13	11	7	4/9/02	4/16/02		TDS-0020	04/10/02	Michael Rennhack
ATK-LL077	RQ-Asbestos	608	36	572	0.004	0.001	17	0	38	4/9/02	4/16/02		TDS-0020	04/10/02	Michael Rennhack
ATK-LL078	RQ-Asbestos	486	36	450	0.128	0.023	23	17	0	4/9/02	4/16/02		TDS-0020	04/10/02	Michael Rennhack
ATK-LL079	RQ-Asbestos	1044	36	1008	0.088	0.008	22	1	10	4/9/02	4/16/02		TDS-0020	04/10/02	Michael Rennhack
ATK-LL080	RQ-Asbestos	1536	36	1500	0.300	0.100	66	0	0	4/9/02	4/16/02		TDS-0021	04/15/02	Michael Rennhack

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ATK-LL081	RQ-Asbestos	397	36	361	0.004	0.001	8	1	0	4/10/02	4/16/02		TDS-0021	04/15/02	Michael Rennhack
ATK-LL082	RQ-Asbestos	1553	36	1517	0.260	0.060	13	5	5	4/10/02	4/16/02		TDS-0021	04/15/02	Michael Rennhack
ATK-LL083	Hepa Units	1613	36	1577	0.001	0.001	7	0	1	4/10/02	4/16/02		TDS-0021	04/15/02	Michael Rennhack
ATK-LL084	Hepa Units	1504	36	1468	0.001	0.001	9	0	5	4/10/02	4/16/02		TDS-0021	04/15/02	Michael Rennhack
ATK-LL085	Hepa Units	1667	36	1631	0.004	0.001	56	32	30	4/10/02	4/16/02		TDS-0021	04/15/02	Michael Rennhack
ATK-LL086	Hepa Units	2863	36	2827	0.001	0.001	15	10	0	4/11/02	4/25/02		TDS-0022	04/23/02	Michael Rennhack
ATK-LL087	Hepa Units	1169	36	1133	0.100	0.020	0	1	10	4/15/02	4/25/02		TDS-0022	04/23/02	Michael Rennhack
ATK-LL088	Hepa Units	2521	36	2485	0.001	0.001	45	33	57	4/15/02	4/25/02		TDS-0022	04/23/02	Michael Rennhack
ATK-LL089	RQ-Asbestos	2240	36	2204	0.025	0.004	42	15	1	4/15/02	4/16/02		TDS-0026	05/15/02	Michael Rennhack
ATK-LL090	RQ-Asbestos	1083	36	1047	0.001	0.001	8	5	13	4/16/02	4/25/02		TDS-0022	04/23/02	Michael Rennhack
ATK-LL091	RQ-Asbestos	692	36	656	0.001	0.001	0	22	35	4/16/02	4/16/02		TDS-0026	05/15/02	Michael Rennhack
ATK-LL092	RQ-Asbestos	900	36	864	0.035	0.005	42	47	20	4/16/02	4/16/02		TDS-0026	05/15/02	Michael Rennhack
ATK-LL093	RQ-Asbestos	1643	36	1607	0.001	0.001	24	22	35	4/16/02	4/16/02		TDS-0026	05/15/02	Michael Rennhack
ATK-LL094	RQ-Asbestos	1316	36	1280	0.270	0.030	20	4	9	4/17/02	4/25/02		TDS-0022	04/23/02	Michael Rennhack
ATK-LL095	RQ-Asbestos	1719	36	1683	0.005	0.001	8	10	0	4/17/02	4/25/02		TDS-0022	04/23/02	Michael Rennhack
ATK-LL096	RQ-Asbestos	1224	36	1188	0.010	0.001	43	13	5	4/22/02	4/25/02		TDS-0023	04/23/02	Michael Rennhack
ATK-LL097	RQ-Asbestos	1792	36	1756	0.004	0.001	21	5	6	4/18/02	4/25/02		TDS-0023	04/23/02	Michael Rennhack
ATK-LL098	RQ-Asbestos	869	36	833	0.004	0.001	0	7	9	4/22/02	4/25/02		TDS-0023	04/23/02	Michael Rennhack
ATK-LL099	RQ-Asbestos	1528	36	1492	0.004	0.001	33	31	151	4/22/02	4/25/02		TDS-0023	04/23/02	Michael Rennhack
ATK-LL100	RQ-Asbestos	1127	36	1091	1.200	0.230	13	7	10	4/22/02	4/25/02		TDS-0023	04/23/02	Michael Rennhack
ATK-LL101	RQ-Asbestos	760	36	724	0.010	0.001	29	1	6	4/22/02	4/25/02		TDS-0023	04/23/02	Michael Rennhack
ATK-LL102	RQ-Asbestos	1086	36	1050	0.170	0.026	26	10	0	4/23/02	4/25/02		TDS-0024	04/29/02	Mike Andrie
ATK-LL103	RQ-Asbestos	1178	36	1142	0.090	0.009	7	5	40	4/23/02	4/25/02		TDS-0024	04/29/02	Mike Andrie
ATK-LL104	RQ-Asbestos	1347	36	1311	0.014	0.002	70	18	8	4/23/02	4/25/02		TDS-0024	04/29/02	Mike Andrie
ATK-LL105	RQ-Asbestos	1570	36	1534	0.028	0.003	72	18	2	4/23/02	4/25/02		TDS-0024	04/29/02	Mike Andrie
ATK-LL106	RQ-Asbestos	831	36	795	0.001	0.001	50	24	20	4/24/02	4/25/02		TDS-0024	04/29/02	Mike Andrie
ATK-LL107	RQ-Asbestos	2043	36	2007	0.046	0.006	40	135	70	4/25/02	5/20/02		TDS-0024	04/29/02	Mike Andrie
ATK-LL108	RQ-Asbestos	838	36	802	0.002	0.001	10	4	9	4/29/02	5/20/02		TDS-0024	04/29/02	Mike Andrie
ATK-LL109	RQ-Asbestos	1255	36	1219	0.004	0.004	2	0	15	4/29/02	5/20/02		TDS-0025	05/08/02	Mike Andrie
ATK-LL110	RQ-Asbestos	2332	36	2296	0.002	0.001	24	7	25	4/30/02	5/20/02		TDS-0025	05/08/02	Mike Andrie
ATK-LL111	1a,2b,4b,6f	2288	36	2252	0.035	0.005	17	7	14	5/6/02	5/20/02		TDS-0025	05/08/02	Mike Andrie
ATK-LL112	1a,2b,4b,6f	2010	36	1974	0.080	0.009	11	21	46	5/8/02	5/20/02		TDS-0025	05/08/02	Mike Andrie
ATK-LL113	1a,2b,4c,6c	2882	36	2846	0.010	0.001	27	21	18	5/8/02	5/20/02		TDS-0025	05/08/02	Mike Andrie
ATK-LL114	1a,2b,4c,6c	2374	36	2338	0.004	0.001	18	3	14	5/8/02	5/20/02		TDS-0025	05/08/02	Mike Andrie
ATK-LL115	1a,2b,4c,6c	1922	36	1886	0.002	0.001	2	24	0	5/8/02	5/20/02		TDS-0034	06/17/02	Michael Rennhack
ATK-LL116	1a,2b,4c,6c	2911	36	2875	0.030	0.004	110	70	40	5/15/02	5/20/02		TDS-0026	05/15/02	Michael Rennhack
ATK-LL117	1a,2b,4c,6c	1884	36	1848	0.005	0.001	30	7	29	5/15/02	5/20/02		TDS-0026	05/15/02	Michael Rennhack
ATK-LL118	1a,2b,4c,6c	2014	36	1978	0.030	0.002	22	6	6	5/15/02	5/20/02		TDS-0034	06/17/02	Michael Rennhack
ATK-LL119	1a,2b,4c,6c	1751	36	1715	0.030	0.002	41	12	10	5/15/02	5/20/02		TDS-0034	06/17/02	Michael Rennhack
ATK-LL120	1a,2b,4c,6c	1623	36	1587	0.060	0.010	5	26	34	5/15/02	5/20/02		TDS-0034	06/17/02	Michael Rennhack

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		Gross *	Tare	Net	Contact	1 Meter	Top	Side	Bottom	Packed	Outdoors	Shipped	Number	Date	Surveyor
ATK-LL121	RQ-Asbestos	893	36	857	0.007	0.001	7	5	0	5/20/02	6/5/02		TDS-0027	05/29/02	Mike Andrie
ATK-LL122	1A,2B,6E,4C	3107	36	3071	0.040	0.005	10	15	49	5/20/02	6/5/02		TDS-0027	05/29/02	Mike Andrie
ATK-LL123	1A,2B,6E,4C	1751	36	1715	0.001	0.001	12	13	14	5/20/02	6/5/02		TDS-0027	05/29/02	Mike Andrie
ATK-LL124	1A,2B,6E,4C	1452	36	1416	0.003	0.001	69	2	25	5/21/02	6/5/02		TDS-0027	05/29/02	Mike Andrie
ATK-LL125	1A, 2B, 4C, 6E	2007	36	1971	0.003	0.001	2	5	33	5/21/02	6/5/02		TDS-0027	05/29/02	Mike Andrie
ATK-LL126	1A, 2B, 4C, 6E	1523	36	1487	0.001	0.001	54	5	25	5/21/02	6/5/02		TDS-0027	05/29/02	Mike Andrie
ATK-LL127	1A, 2B, 4C, 6E	1450	36	1414	0.001	0.001	10	15	5	5/21/02	6/5/02		TDS-0027	05/29/02	Mike Andrie
ATK-LL128	1A, 2B, 4C, 6E	666	36	630	0.036	0.003	9	5	2	5/28/02	6/5/02		TDS-0027	05/29/02	Mike Andrie
ATK-LL129	1A, 2B, 4C, 6E	2578	36	2542	0.006	0.001	14	7	15	5/29/02	6/5/02		TDS-0028	05/30/02	Mike Andrie
ATK-LL130	1A, 2B, 4C, 6E	977	36	941	0.001	0.001	10	7	6	5/29/02	6/5/02		TDS-0028	05/30/02	Mike Andrie
ATK-LL131	1A, 2B, 4C, 6E	1606	36	1570	0.100	0.009	25	10	60	5/29/02	6/5/02		TDS-0028	05/30/02	Mike Andrie
ATK-LL132	1A, 2B, 4C, 6E	1906	36	1870	0.001	0.001	18	6	97	5/29/02	6/5/02		TDS-0028	05/30/02	Mike Andrie
ATK-LL133	RQ-Asbestos	1872	36	1836	0.004	0.001	17	6	20	5/29/02	6/5/02		TDS-0034	06/17/02	Michael Rennhack
ATK-LL134	1A, 2B, 4D, 6C	1080	36	1044	0.004	0.001	19	10	10	5/30/02	6/5/02		TDS-0028	05/30/02	Mike Andrie
ATK-LL135	1A, 2B, 4D, 6C	1179	36	1143	0.001	0.001	40	4	14	5/30/02	6/5/02		TDS-0028	05/30/02	Mike Andrie
ATK-LL136	1A, 2B, 4D, 6C	889	36	853	0.001	0.001	29	25	18	5/30/02	6/5/02		TDS-0028	05/30/02	Mike Andrie
ATK-LL137	1A, 2B, 4D, 6C	926	36	890	0.095	0.008	12	12	10	5/30/02	6/5/02		TDS-0029	06/04/02	Mike Andrie
ATK-LL138	1A, 2B, 4D, 6C	1131	36	1095	0.001	0.001	19	20	21	5/30/02	6/5/02		TDS-0029	06/04/02	Mike Andrie
ATK-LL139	1A, 2B, 4D, 6C	1003	36	967	0.250	0.031	26	7	11	5/30/02	6/5/02		TDS-0029	06/04/02	Mike Andrie
ATK-LL140	1A, 2B, 4D, 6C	912	36	876	0.005	0.001	22	15	7	5/30/02	6/5/02		TDS-0029	06/04/02	Mike Andrie
ATK-LL141	1A, 2B, 4D, 6C	885	36	849	0.008	0.001	13	9	18	5/30/02	6/5/02		TDS-0029	06/04/02	Mike Andrie
ATK-LL142	1A, 2B, 4D, 6C	1157	36	1121	0.008	0.002	21	6	11	6/5/02	6/12/02		TDS-0029	06/04/02	Mike Andrie
ATK-LL143	1A, 2B, 4D, 6C	2733	36	2697	0.025	0.003	37	14	0	6/5/02	6/12/02		TDS-0029	06/04/02	Mike Andrie
ATK-LL144	1A, 2B, 4D, 6C	2130	36	2094	0.001	0.001	2	2	6	6/5/02	6/12/02		TDS-0030	06/10/02	Mike Andrie
ATK-LL145	1A, 2B, 4D, 6C	2078	36	2042	0.001	0.001	18	2	0	6/5/02	6/12/02		TDS-0030	06/10/02	Mike Andrie
ATK-LL146	1A, 2B, 4D, 6C	1586	36	1550	0.002	0.001	18	2	2	6/6/02	6/12/02		TDS-0030	06/10/02	Mike Andrie
ATK-LL147	RQ-Asbestos	1437	36	1401	0.001	0.001	0	0	6	6/6/02	6/12/02		TDS-0030	06/10/02	Mike Andrie
ATK-LL148	1A, 2B, 4D, 6C	1364	36	1328	0.001	0.001	6	2	0	6/6/02	6/12/02		TDS-0030	06/10/02	Mike Andrie
ATK-LL149	1A, 2B, 4D, 6C	1274	36	1238	0.001	0.001	10	0	0	6/6/02	6/12/02		TDS-0030	06/10/02	Mike Andrie
ATK-LL150	1A, 2B, 4D, 6C	915	36	879	0.004	0.001	18	2	0	6/10/02	6/12/02		TDS-0030	06/10/02	Mike Andrie
ATK-LL151	1A, 2B, 4D, 6C	1260	36	1224	0.001	0.001	11	0	20	6/10/02	6/12/02		TDS-0031	06/11/02	Mike Andrie
ATK-LL152	1A, 2B, 4D, 6C	1355	36	1319	0.002	0.001	8	8	23	6/10/02	6/12/02		TDS-0031	06/11/02	Mike Andrie
ATK-LL153	1A, 2B, 4D, 6C	1101	36	1065	0.001	0.001	32	15	15	6/10/02	6/12/02		TDS-0031	06/11/02	Mike Andrie
ATK-LL154	1A, 2B, 4D, 6C	1040	36	1004	0.001	0.001	32	8	3	6/10/02	6/12/02		TDS-0031	06/11/02	Mike Andrie
ATK-LL155	1A, 2B, 4D, 6C	1197	36	1161	0.001	0.001	12	8	8	6/10/02	6/12/02		TDS-0031	06/11/02	Mike Andrie
ATK-LL156	1A, 2B, 4D, 6C	1116	36	1080	0.001	0.001	29	7	26	6/11/02	6/12/02		TDS-0031	06/11/02	Mike Andrie
ATK-LL157	1A, 2B, 4D, 6C	980	36	944	0.001	0.001	22	19	16	6/11/02	6/12/02		TDS-0031	06/11/02	Mike Andrie
ATK-LL158	1A, 2B, 4D, 6C	975	36	939	0.001	0.001	5	0	2	6/11/02	6/12/02		TDS-0032	06/12/02	Mike Andrie
ATK-LL159	1A, 2B, 4D, 6C	1461	36	1425	0.001	0.001	24	2	2	6/11/02	6/12/02		TDS-0032	06/12/02	Mike Andrie
ATK-LL160	1A, 2B, 4D, 6C	1288	36	1252	0.001	0.001	9	2	10	6/11/02	6/12/02		TDS-0032	06/12/02	Mike Andrie

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ATK-LL161	1A, 2B, 4D, 6C	753	36	717	0.001	0.001	2	33	7	6/11/02	6/12/02		TDS-0032	06/12/02	Mike Andrle
ATK-LL162	1A, 2B, 4D, 6C	1331	36	1295	0.001	0.001	15	2	6	6/12/02	6/12/02		TDS-0032	06/12/02	Mike Andrle
ATK-LL163	1A, 2B, 4D, 6C	1160	36	1124	0.001	0.001	2	7	2	6/12/02	6/12/02		TDS-0032	06/12/02	Mike Andrle
ATK-LL164	1A, 2B, 4D, 6C	1414	36	1378	0.001	0.001	41	33	13	6/12/02	6/12/02		TDS-0032	06/12/02	Mike Andrle
ATK-LL165	1A, 2B, 4D, 6C	1470	36	1434	0.001	0.001	15	0	0	6/12/02	6/14/02		TDS-0033	06/14/02	Mike Andrle
ATK-LL166	1A, 2B, 4D, 6C	1510	36	1474	0.001	0.001	6	6	9	6/12/02	6/14/02		TDS-0033	06/14/02	Mike Andrle
ATK-LL167	1A, 2B, 4D, 6C	1268	36	1232	0.001	0.001	23	4	0	6/13/02	6/14/02		TDS-0033	06/14/02	Mike Andrle
ATK-LL168	1A, 2B, 4D, 6C	1385	36	1349	0.001	0.001	12	2	2	6/14/02	6/14/02		TDS-0033	06/14/02	Mike Andrle
ATK-LL169	1A, 2B, 4D, 6C	1938	36	1902	0.001	0.001	32	0	1	6/17/02	6/24/02		TDS-0034	06/19/02	Mike Andrle
ATK-LL170	1A, 2B, 4D, 6C	1797	36	1761	0.003	0.001	24	3	13	6/17/02	6/24/02		TDS-0034	06/19/02	Mike Andrle
ATK-LL171	1A, 2B, 4D, 6C	2042	36	2006	0.001	0.001	15	3	0	6/17/02	6/24/02		TDS-0034	06/19/02	Mike Andrle
ATK-LL172	1A, 2B, 4D, 6C	1597	36	1561	0.001	0.001	13	7	1	6/17/02	6/24/02		TDS-0034	06/19/02	Mike Andrle
ATK-LL173	1A, 2B, 4D, 6C	1367	36	1331	0.001	0.001	24	7	37	6/18/02	6/24/02		TDS-0034	06/19/02	Mike Andrle
ATK-LL174	1A, 2B, 4D, 6C	1751	36	1715	0.001	0.001	12	7	7	6/19/02	6/24/02		TDS-0034	06/19/02	Mike Andrle
ATK-LL175	1A, 2B, 4D, 6C	1059	36	1023	0.001	0.001	3	26	4	6/19/02	6/24/02		TDS-0034	06/19/02	Mike Andrle
ATK-LL176	1A, 2B, 4D, 6C	1814	36	1778	0.001	0.001	7	8	47	6/20/02	6/24/02		TDS-0035	06/24/02	Mike Andrle
ATK-LL177	1A, 2B, 4D, 6C	1255	36	1219	0.001	0.001	20	10	2	6/21/02	6/24/02		TDS-0035	06/24/02	Mike Andrle
ATK-LL178	1A, 2B, 4D, 6C	2175	36	2139	0.001	0.001	21	12	8	6/24/02	6/24/02		TDS-0035	06/24/02	Mike Andrle
ATK-LL179	1A, 2B, 4D, 6C	1321	36	1285	0.001	0.001	42	5	10	6/24/02	6/24/02		TDS-0035	06/24/02	Mike Andrle
ATK-LL180	1A, 2B, 4D, 6C	1433	36	1397	0.001	0.001	59	4	0	6/25/02	6/24/02		TDS-0035	06/24/02	Mike Andrle
ATK-LL181	1A, 2B, 4D, 6C	1174	36	1138	0.001	0.001	4	4	12	6/25/02	6/24/02		TDS-0035	06/24/02	Mike Andrle
ATK-LL182	1A, 2B, 4D, 6C	1395	36	1359	0.001	0.001	20	9	16	6/25/02	6/24/02		TDS-0035	06/24/02	Mike Andrle
ATK-LL183	1A, 2B, 4D, 6C	1582	36	1546	0.001	0.001	18	0	4	6/25/02	7/17/02		TDS-0036	06/28/02	Mike Andrle
ATK-LL184	1A, 2B, 4D, 6C	1582	36	1546	0.001	0.001	7	3	7	6/26/02	7/17/02		TDS-0036	06/28/02	Mike Andrle
ATK-LL185	1A, 2B, 4D, 6C	704	36	668	0.001	0.001	0	3	12	6/26/02	7/17/02		TDS-0036	06/28/02	Mike Andrle
ATK-LL186	1A, 2B, 4D, 6C	1939	36	1903	0.001	0.001	26	12	3	6/26/02	7/17/02		TDS-0036	06/28/02	Mike Andrle
ATK-LL187	1A, 2B, 4D, 6C	1014	36	978	0.001	0.001	17	5	10	6/27/02	7/17/02		TDS-0036	06/28/02	Mike Andrle
ATK-LL188	1A, 2B, 4D, 6C	2088	36	2052	0.001	0.001	7	2	2	6/27/02	7/17/02		TDS-0036	06/28/02	Mike Andrle
ATK-LL189	1A, 2B, 4D, 6C	2189	36	2153	0.001	0.001	56	47	0	6/27/02	7/17/02		TDS-0036	06/28/02	Mike Andrle
ATK-LL190	1A, 2B, 4D, 6C	2781	36	2745	0.001	0.001	13	10	7	6/28/02	7/17/02		TDS-0037	07/03/02	Mike Andrle
ATK-LL191	1A, 2B, 4D, 6C	1071	36	1035	0.001	0.001	3	7	13	6/28/02	7/17/02		TDS-0037	07/03/02	Mike Andrle
ATK-LL192	1A, 2B, 4D, 6C	1506	36	1470	0.001	0.001	3	0	4	6/28/02	7/17/02		TDS-0037	07/03/02	Mike Andrle
ATK-LL193	1A, 2B, 4D, 6C	2696	36	2660	0.001	0.001	2	3	0	7/1/02	7/17/02		TDS-0037	07/03/02	Mike Andrle
ATK-LL194	1A, 2B, 4D, 6C	1436	36	1400	0.001	0.001	3	3	7	7/2/02	7/17/02		TDS-0037	07/03/02	Mike Andrle
ATK-LL195	1A, 2B, 4D, 6C	1375	36	1339	0.001	0.001	7	3	4	7/3/02	7/17/02		TDS-0037	07/03/02	Mike Andrle
ATK-LL196	1A, 2B, 4D, 6C	1381	36	1345	0.060	0.007	17	14	7	7/3/02	7/17/02		TDS-0037	07/03/02	Mike Andrle
ATK-LL197	1A, 2B, 4D, 6C	766	36	730	0.001	0.001	11	0	7	7/8/02	7/17/02		TDS-0038	07/15/02	Mike Andrle
ATK-LL198	1A, 2B, 4D, 6C	1386	36	1350	0.001	0.001	0	5	0	7/8/02	7/17/02		TDS-0038	07/15/02	Mike Andrle
ATK-LL199	1A, 2B, 4D, 6C	1405	36	1369	0.001	0.001	2	13	8	7/11/02	7/17/02		TDS-0038	07/15/02	Mike Andrle
ATK-LL200	Soil, Rocks	3446	36	3410	0.001	0.001	7	7	2	7/11/02	7/17/02		TDS-0038	07/15/02	Mike Andrle

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ATK-LL201	Soil, Rocks	3352	36	3316	0.001	0.001	3	11	4	7/11/02	7/17/02		TDS-0038	07/15/02	Mike Andrie
ATK-LL202	Soil, Rocks	5380	36	5344	0.001	0.001	3	2	2	7/11/02	7/17/02		TDS-0038	07/15/02	Mike Andrie
ATK-LL203	Soil, Rocks	5890	36	5854	0.001	0.001	0	2	2	7/15/02	7/17/02		TDS-0038	07/15/02	Mike Andrie
ATK-LL204	RQ-Asbestos	2284	36	2248	0.001	0.001	1	3	3	7/15/02	7/17/02		TDS-0039	07/17/02	Mike Andrie
ATK-LL205	1A, 2B, 4D, 6C	970	36	934	0.001	0.001	17	3	1	7/15/02	7/17/02		TDS-0039	07/17/02	Mike Andrie
ATK-LL206	1A, 2B, 4D, 6C	690	36	654	0.001	0.001	39	9	0	7/15/02	7/17/02		TDS-0039	07/17/02	Mike Andrie
ATK-LL207	1A, 2B, 4D, 6C	1411	36	1375	0.001	0.001	10	0	3	7/15/02	7/17/02		TDS-0039	07/17/02	Mike Andrie
ATK-LL208	1A, 2B, 4D, 6C	788	36	752	0.001	0.001	39	3	42	7/15/02	7/17/02		TDS-0039	07/17/02	Mike Andrie
ATK-LL209	1A, 2B, 4D, 6C	1040	36	1004	0.180	0.016	44	0	3	7/16/02	7/17/02		TDS-0039	07/17/02	Mike Andrie
ATK-LL210	1A, 2B, 4D, 6C	1277	36	1241	0.001	0.001	88	7	3	7/17/02	7/17/02		TDS-0039	07/17/02	Mike Andrie
ATK-LL211	1A, 2B, 4D, 6C	1227	36	1191	0.001	0.001	84	7	7	7/17/02	7/29/02		TDS-0040	07/23/02	Mike Andrie
ATK-LL212	RQ-Asbestos	1700	36	1664	0.001	0.001	53	7	7	7/17/02	7/29/02		TDS-0040	07/23/02	Mike Andrie
ATK-LL213	RQ-Asbestos	1345	36	1309	0.001	0.001	59	13	11	7/18/02	7/29/02		TDS-0040	07/23/02	Mike Andrie
ATK-LL214	1A, 2B, 4D, 6C	950	36	914	0.001	0.001	38	0	4	7/18/02	7/29/02		TDS-0040	07/23/02	Mike Andrie
ATK-LL215	1A, 2B, 4D, 6C	975	36	939	0.001	0.001	95	0	4	7/18/02	7/29/02		TDS-0040	07/23/02	Mike Andrie
ATK-LL216	1A, 2B, 4D, 6C	1047	36	1011	0.001	0.001	62	1	0	7/18/02	7/29/02		TDS-0040	07/23/02	Mike Andrie
ATK-LL217	1A, 2B, 4D, 6C	784	36	748	0.001	0.001	189	7	7	7/22/02	7/29/02		TDS-0040	07/23/02	Mike Andrie
ATK-LL218	RQ-Asbestos	2111	36	2075	0.003	0.001				7/23/02	7/29/02		TDS-0041		Mike Andrie
ATK-LL219	1A, 2B, 4F	1691	36	1655	0.001	0.001				7/24/02	7/29/02		TDS-0041		Mike Andrie
ATK-LL220	1A, 2B, 4F	1374	36	1338	0.001	0.001				7/24/02	7/29/02		TDS-0041		Mike Andrie
ATK-LL221	1A, 2B, 4F	1275	36	1239	0.001	0.001				7/24/02	7/29/02		TDS-0041		Mike Andrie
ATK-LL222	1A, 2B, 4F	1346	36	1310	0.001	0.001				7/25/02	7/29/02		TDS-0041		Mike Andrie
ATK-LL223	1A, 2B, 4F	1003	36	967	0.001	0.001				7/25/02	7/29/02		TDS-0041		Mike Andrie
ATK-LL224	1A, 2B, 4F	1274	36	1238	0.010	0.001				7/29/02	7/29/02		TDS-0041		Mike Andrie
ATK-LL225	1A, 2B, 4F	920	36	884	0.010	0.001				7/29/02					
ATK-LL226	RQ-Asbestos	1712	36	1676	0.001	0.001				7/30/02					
ATK-LL227	1A, 2B, 4F	1057	36	1021	0.009	0.002				7/30/02					
ATK-LL228			36												
ATK-LL229			36												
ATK-LL230			36												
ATK-LL231			36												
ATK-LL232			36												
ATK-LL233			36												
ATK-LL234			36												
ATK-LL235			36												
ATK-LL236			36												
ATK-LL237			36												
ATK-LL238			36												
ATK-LL239			36												
ATK-LL240			36												

1 = Wood
2 = Plastic
3 = Paper
4 = Metal
5 = Soil
6 = Concrete

A = 1"
B = 2"
C = 4"
D = 6"
E = 10"
F = 20"

Container ID	Content/Size Code	Dose Rate mR/Hr		Net Weight		U238 SpA	U238 FW	U238 Mass	U235 Mass	DU FW	Pkg
		Contact	Average	Lbs	Grams	pCi/gm		gm	gm		Density
ATK-LL001	1A,2B,3B,4B	0.001	0.000	3204	1.45E+06	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.13E-01
ATK-LL002	1A,2B,3B,4B	0.012	0.005	2279	1.03E+06	93.4	2.80E-04	2.90E+02	8.50E-01	2.81E-04	5.07E-01
ATK-LL003	1A,2B,3B,4B	0.001	0.000	2626	1.19E+06	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.84E-01
ATK-LL004	1A,2B,3B,4B	0.001	0.000	3173	1.44E+06	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.06E-01
ATK-LL005	1A,2B,3B,4B	0.001	0.000	2448	1.11E+06	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.45E-01
ATK-LL006	1A,2B,3B,4B	0.001	0.000	3090	1.40E+06	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.88E-01
ATK-LL007	1A,2B,3B,4B	0.001	0.000	2542	1.15E+06	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.66E-01
ATK-LL008	1A,2B,3B,4B	0.001	0.000	4868	2.21E+06	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.08E+00
ATK-LL009	1A,2B,3B,4B	0.002	0.001	3953	1.79E+06	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.80E-01
ATK-LL010	1A,2B,3B,4B	0.005	0.002	896	4.07E+05	10.0	3.00E-05	1.22E+01	3.58E-02	3.01E-05	1.99E-01
ATK-LL011	1A,2B,3B,4B	0.022	0.009	2658	1.21E+06	171.2	5.14E-04	6.20E+02	1.82E+00	5.16E-04	5.92E-01
ATK-LL012	1A,2B,3B,4B	0.011	0.004	2072	9.41E+05	85.6	2.57E-04	2.42E+02	7.09E-01	2.58E-04	4.61E-01
ATK-LL014	1A,2B,3B,4B	0.200	0.078	2401	1.09E+06	1,556.5	4.67E-03	5.10E+03	1.49E+01	4.69E-03	5.34E-01
ATK-LL015	1A,2B,3B,4B	0.030	0.012	1882	8.54E+05	233.5	7.01E-04	5.99E+02	1.76E+00	7.03E-04	4.19E-01
ATK-LL016	1A,2B,3B,4B	0.010	0.004	3075	1.40E+06	77.8	2.34E-04	3.26E+02	9.56E-01	2.34E-04	6.84E-01
ATK-LL017	1A,2B,3B,4B	0.100	0.039	1924	8.73E+05	778.2	2.34E-03	2.04E+03	5.98E+00	2.34E-03	4.28E-01
ATK-LL018	1A,2B,3B,4B	0.060	0.023	1913	8.69E+05	466.9	1.40E-03	1.22E+03	3.57E+00	1.41E-03	4.26E-01
ATK-LL019	1A,2B,3B,4B	0.030	0.012	1096	4.98E+05	233.5	7.01E-04	3.49E+02	1.02E+00	7.03E-04	2.44E-01
ATK-LL020	1A,2B,3B,4B	0.008	0.003	2338	1.06E+06	62.3	1.87E-04	1.98E+02	5.81E-01	1.88E-04	5.20E-01
ATK-LL021	1A,2B,3B,4B	0.004	0.002	1185	5.38E+05	10.0	3.00E-05	1.62E+01	4.73E-02	3.01E-05	2.64E-01
ATK-LL022	1A,2B,3B,4B	0.001	0.000	2230	1.01E+06	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.96E-01
ATK-LL023	1A,2B,3B,4B	0.001	0.000	1069	4.85E+05	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.38E-01
ATK-LL024	1A,2B,3B,4B	0.004	0.002	1408	6.39E+05	10.0	3.00E-05	1.92E+01	5.62E-02	3.01E-05	3.13E-01
ATK-LL025	1A,2B,3B,4B	0.001	0.000	1202	5.46E+05	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.68E-01
ATK-LL026	1A,2B,3B,4B	0.001	0.000	1814	8.24E+05	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.04E-01
ATK-LL027	1A,2B,3B,4B	0.004	0.002	2475	1.12E+06	10.0	3.00E-05	3.37E+01	9.89E-02	3.01E-05	5.51E-01
ATK-LL028	1A,2B,3B,4B	0.250	0.097	1679	7.62E+05	1,945.6	5.84E-03	4.45E+03	1.30E+01	5.86E-03	3.74E-01
ATK-LL029	RQ-Asbestos	0.002	0.001	942	4.28E+05	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.10E-01
ATK-LL030	RQ-Asbestos	0.110	0.043	1312	5.96E+05	856.1	2.57E-03	1.53E+03	4.49E+00	2.58E-03	2.92E-01
ATK-LL031	RQ-Asbestos	0.250	0.097	2360	1.07E+06	1,945.6	5.84E-03	6.26E+03	1.83E+01	5.86E-03	5.25E-01
ATK-LL032	RQ-Asbestos	0.250	0.097	2022	9.18E+05	1,945.6	5.84E-03	5.36E+03	1.57E+01	5.86E-03	4.50E-01
ATK-LL033	RQ-Asbestos	0.050	0.019	2689	1.22E+06	389.1	1.17E-03	1.43E+03	4.18E+00	1.17E-03	5.98E-01
ATK-LL034	RQ-Asbestos	0.220	0.086	1868	8.48E+05	1,712.1	5.14E-03	4.36E+03	1.28E+01	5.16E-03	4.16E-01
ATK-LL035	RQ-Asbestos	0.001	0.000	2434	1.11E+06	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.42E-01
ATK-LL036	RQ-Asbestos	0.001	0.000	2310	1.05E+06	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.14E-01
ATK-LL037	RQ-Asbestos	0.030	0.012	2844	1.29E+06	233.5	7.01E-04	9.05E+02	2.65E+00	7.03E-04	6.33E-01
ATK-LL038	RQ-Asbestos	0.004	0.002	2165	9.83E+05	10.0	3.00E-05	2.95E+01	8.65E-02	3.01E-05	4.82E-01
ATK-LL039	RQ-Asbestos	0.004	0.002	2392	1.09E+06	10.0	3.00E-05	3.26E+01	9.56E-02	3.01E-05	5.32E-01
ATK-LL040	RQ-Asbestos	0.015	0.006	2824	1.28E+06	116.7	3.51E-04	4.49E+02	1.32E+00	3.52E-04	6.28E-01
ATK-LL041	RQ-Asbestos	0.004	0.002	2947	1.34E+06	10.0	3.00E-05	4.02E+01	1.18E-01	3.01E-05	6.56E-01
ATK-LL042	RQ-Asbestos	0.020	0.008	2939	1.33E+06	155.6	4.67E-04	6.24E+02	1.83E+00	4.69E-04	6.54E-01
ATK-LL043	RQ-Asbestos	0.002	0.001	3048	1.38E+06	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.78E-01
ATK-LL044	RQ-Asbestos	0.005	0.002	1770	8.04E+05	10.0	3.00E-05	2.41E+01	7.07E-02	3.01E-05	3.94E-01
ATK-LL045	RQ-Asbestos	0.004	0.002	1573	7.14E+05	10.0	3.00E-05	2.14E+01	6.28E-02	3.01E-05	3.50E-01
ATK-LL046	1A,2B,3B,4B	0.004	0.002	1227	5.57E+05	10.0	3.00E-05	1.67E+01	4.90E-02	3.01E-05	2.73E-01
ATK-LL047	1A,2B,3B,4B	0.070	0.027	1006	4.57E+05	544.8	1.64E-03	7.47E+02	2.19E+00	1.64E-03	2.24E-01
ATK-LL051	1C,4C,6D	0.020	0.008	1370	6.22E+05	155.6	4.67E-04	2.91E+02	8.52E-01	4.69E-04	3.05E-01
ATK-LL052	1A,4E,6C	0.060	0.023	1022	4.64E+05	466.9	1.40E-03	6.51E+02	1.91E+00	1.41E-03	2.27E-01
ATK-LL053	1A,4E,6C	0.040	0.016	2046	9.29E+05	311.3	9.35E-04	8.68E+02	2.54E+00	9.38E-04	4.55E-01
ATK-LL054	1C,4E,2C	0.003	0.001	1973	8.96E+05	10.0	3.00E-05	2.69E+01	7.88E-02	3.01E-05	4.39E-01
ATK-LL055	1C,4E,2C	0.055	0.021	2412	1.10E+06	428.0	1.29E-03	1.41E+03	4.12E+00	1.29E-03	5.37E-01
ATK-LL056	1A,2B,3B,4B	0.004	0.002	1194	5.42E+05	10.0	3.00E-05	1.63E+01	4.77E-02	3.01E-05	2.66E-01
ATK-LL060	4E,4F	0.105	0.041	1115	5.06E+05	817.2	2.45E-03	1.24E+03	3.64E+00	2.46E-03	2.48E-01
ATK-LL061	4E,4F	0.004	0.002	2235	1.01E+06	10.0	3.00E-05	3.05E+01	8.93E-02	3.01E-05	4.97E-01
ATK-LL062	4E,4F	0.100	0.039	1089	4.94E+05	778.2	2.34E-03	1.16E+03	3.39E+00	2.34E-03	2.42E-01
ATK-LL063	4E,4F	0.001	0.000	1144	5.19E+05	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.55E-01
ATK-LL064	RQ-Asbestos	0.004	0.002	1305	5.92E+05	10.0	3.00E-05	1.78E+01	5.21E-02	3.01E-05	2.90E-01
ATK-LL065	RQ-Asbestos	0.004	0.002	1113	5.05E+05	10.0	3.00E-05	1.52E+01	4.45E-02	3.01E-05	2.48E-01
ATK-LL068	RQ-Asbestos	0.200	0.078	1160	5.27E+05	1,556.5	4.67E-03	2.46E+03	7.21E+00	4.69E-03	2.58E-01
ATK-LL069	RQ-Asbestos	0.001	0.000	1024	4.65E+05	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.28E-01
ATK-LL070	RQ-Asbestos	0.001	0.000	699	3.17E+05	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.56E-01
ATK-LL071	Sheet Metal	0.004	0.002	1203	5.46E+05	10.0	3.00E-05	1.64E+01	4.81E-02	3.01E-05	2.68E-01
ATK-LL072	RQ-Asbestos	0.140	0.055	677	3.07E+05	1,089.5	3.27E-03	1.01E+03	2.95E+00	3.28E-03	1.51E-01
ATK-LL074	RQ-Asbestos	0.010	0.004	1307	5.93E+05	77.8	2.34E-04	1.39E+02	4.06E-01	2.34E-04	2.91E-01
ATK-LL075	RQ-Asbestos	0.060	0.023	519	2.36E+05	466.9	1.40E-03	3.30E+02	9.68E-01	1.41E-03	1.16E-01

Container ID	Content/Size Code	Dose Rate mR/Hr		Net Weight		U238 SpA	U238 Fw	U238 Mass	U235 Mass	DU Fw	Pkg
		Contact	Average	Lbs	Grams	pCi/gm		gm	gm		Density
ATK-LL077	RQ-Asbestos	0.004	0.002	572	2.60E+05	10.0	3.00E-05	7.80E+00	2.28E-02	3.01E-05	1.27E-01
ATK-LL078	RQ-Asbestos	0.128	0.050	450	2.04E+05	996.1	2.99E-03	6.11E+02	1.79E+00	3.00E-03	1.00E-01
ATK-LL079	RQ-Asbestos	0.088	0.034	1008	4.58E+05	684.9	2.06E-03	9.41E+02	2.76E+00	2.06E-03	2.24E-01
ATK-LL081	RQ-Asbestos	0.004	0.002	361	1.64E+05	10.0	3.00E-05	4.92E+00	1.44E-02	3.01E-05	8.03E-02
ATK-LL083	Hepa Units	0.001	0.000	1577	7.16E+05	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.51E-01
ATK-LL084	Hepa Units	0.001	0.000	1468	6.66E+05	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.27E-01
ATK-LL085	Hepa Units	0.004	0.002	1631	7.40E+05	10.0	3.00E-05	2.22E+01	6.52E-02	3.01E-05	3.63E-01
ATK-LL086	Hepa Units	0.001	0.000	2827	1.28E+06	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.29E-01
ATK-LL087	Hepa Units	0.100	0.039	1133	5.14E+05	778.2	2.34E-03	1.20E+03	3.52E+00	2.34E-03	2.52E-01
ATK-LL088	Hepa Units	0.001	0.000	2485	1.13E+06	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.53E-01
ATK-LL089	RQ-Asbestos	0.025	0.010	2204	1.00E+06	194.6	5.84E-04	5.85E+02	1.71E+00	5.86E-04	4.90E-01
ATK-LL090	RQ-Asbestos	0.001	0.000	1047	4.75E+05	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.33E-01
ATK-LL091	RQ-Asbestos	0.001	0.000	656	2.98E+05	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.46E-01
ATK-LL092	RQ-Asbestos	0.035	0.014	864	3.92E+05	272.4	8.18E-04	3.21E+02	9.40E-01	8.20E-04	1.92E-01
ATK-LL093	RQ-Asbestos	0.001	0.000	1607	7.30E+05	0.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.58E-01
ATK-LL095	RQ-Asbestos	0.005	0.002	1683	7.64E+05	10.0	3.00E-05	2.29E+01	6.72E-02	3.01E-05	3.75E-01
ATK-LL096	RQ-Asbestos	0.010	0.004	1188	5.39E+05	77.8	2.34E-04	1.26E+02	3.69E-01	2.34E-04	2.64E-01
ATK-LL097	RQ-Asbestos	0.004	0.002	1756	7.97E+05	10.0	3.00E-05	2.39E+01	7.01E-02	3.01E-05	3.91E-01
ATK-LL098	RQ-Asbestos	0.004	0.002	833	3.78E+05	10.0	3.00E-05	1.14E+01	3.33E-02	3.01E-05	1.85E-01
ATK-LL099	RQ-Asbestos	0.004	0.002	1492	6.77E+05	10.0	3.00E-05	2.03E+01	5.96E-02	3.01E-05	3.32E-01
ATK-LL101	RQ-Asbestos	0.010	0.004	724	3.29E+05	77.8	2.34E-04	7.68E+01	2.25E-01	2.34E-04	1.61E-01
ATK-LL102	RQ-Asbestos	0.170	0.029	1050	4.77E+05	582.2	1.75E-03	8.33E+02	2.44E+00	1.75E-03	2.34E-01
ATK-LL103	RQ-Asbestos	0.090	0.016	1142	5.18E+05	316.0	9.49E-04	4.92E+02	1.44E+00	9.52E-04	2.54E-01
ATK-LL104	RQ-Asbestos	0.014	0.005	1311	5.95E+05	96.5	2.90E-04	1.72E+02	5.05E-01	2.91E-04	2.92E-01
ATK-LL105	RQ-Asbestos	0.028	0.007	1534	6.96E+05	143.0	4.30E-04	2.99E+02	8.77E-01	4.31E-04	3.41E-01
ATK-LL106	RQ-Asbestos	0.001	0.001	795	3.61E+05	10.0	3.00E-05	1.08E+01	3.18E-02	3.01E-05	1.77E-01
ATK-LL107	RQ-Asbestos	0.046	0.013	2007	9.11E+05	252.8	7.59E-04	6.92E+02	2.03E+00	7.61E-04	4.47E-01
ATK-LL108	RQ-Asbestos	0.002	0.001	802	3.64E+05	10.0	3.00E-05	1.09E+01	3.20E-02	3.01E-05	1.78E-01
ATK-LL109	RQ-Asbestos	0.004	0.004	1219	5.53E+05	79.8	2.40E-04	1.33E+02	3.89E-01	2.40E-04	2.71E-01
ATK-LL110	RQ-Asbestos	0.002	0.002	2296	1.04E+06	10.0	3.00E-05	3.13E+01	9.17E-02	3.01E-05	5.11E-01
ATK-LL111	1a,2b,4b,6f	0.035	0.023	2252	1.02E+06	449.1	1.35E-03	1.38E+03	4.04E+00	1.35E-03	5.01E-01
ATK-LL112	1a,2b,4b,6f	0.080	0.038	1974	8.96E+05	765.1	2.30E-03	2.06E+03	6.03E+00	2.30E-03	4.39E-01
ATK-LL113	1a,2b,4c,6c	0.010	0.003	2846	1.29E+06	10.0	3.00E-05	3.88E+01	1.14E-01	3.01E-05	6.33E-01
ATK-LL114	1a,2b,4c,6c	0.004	0.004	2338	1.06E+06	79.8	2.40E-04	2.54E+02	7.46E-01	2.40E-04	5.20E-01
ATK-LL115	1a,2b,4c,6c	0.002	0.001	1886	8.56E+05	10.0	3.00E-05	2.57E+01	7.53E-02	3.01E-05	4.20E-01
ATK-LL116	1a,2b,4c,6c	0.030	0.013	2875	1.31E+06	266.1	7.99E-04	1.04E+03	3.06E+00	8.02E-04	6.40E-01
ATK-LL117	1a,2b,4c,6c	0.005	0.005	1848	8.39E+05	99.8	3.00E-04	2.51E+02	7.37E-01	3.01E-04	4.11E-01
ATK-LL118	1a,2b,4c,6c	0.030	0.007	1978	8.98E+05	133.1	4.00E-04	3.59E+02	1.05E+00	4.01E-04	4.40E-01
ATK-LL119	1a,2b,4c,6c	0.030	0.007	1715	7.79E+05	133.1	4.00E-04	3.11E+02	9.12E-01	4.01E-04	3.82E-01
ATK-LL120	1a,2b,4c,6c	0.060	0.031	1587	7.20E+05	615.4	1.85E-03	1.33E+03	3.90E+00	1.85E-03	3.53E-01
ATK-LL121	RQ-Asbestos	0.007	0.006	857	3.89E+05	123.1	3.70E-04	1.44E+02	4.21E-01	3.71E-04	1.91E-01
ATK-LL122	1A,2B,6E,4C	0.040	0.023	3071	1.39E+06	465.7	1.40E-03	1.95E+03	5.71E+00	1.40E-03	6.83E-01
ATK-LL123	1A,2B,6E,4C	0.001	0.001	1715	7.79E+05	10.0	3.00E-05	2.34E+01	6.85E-02	3.01E-05	3.82E-01
ATK-LL124	1A,2B,6E,4C	0.003	0.003	1416	6.43E+05	59.9	1.80E-04	1.16E+02	3.39E-01	1.80E-04	3.15E-01
ATK-LL125	1A, 2B, 4C, 6E	0.003	0.003	1971	8.95E+05	59.9	1.80E-04	1.61E+02	4.71E-01	1.80E-04	4.39E-01
ATK-LL126	1A, 2B, 4C, 6E	0.001	0.001	1487	6.75E+05	10.0	3.00E-05	2.03E+01	5.94E-02	3.01E-05	3.31E-01
ATK-LL127	1A, 2B, 4C, 6E	0.001	0.001	1414	6.42E+05	10.0	3.00E-05	1.93E+01	5.65E-02	3.01E-05	3.15E-01
ATK-LL128	1A, 2B, 4C, 6E	0.036	0.009	630	2.86E+05	186.3	5.59E-04	1.60E+02	4.69E-01	5.61E-04	1.40E-01
ATK-LL129	1A, 2B, 4C, 6E	0.006	0.004	2542	1.15E+06	86.5	2.60E-04	3.00E+02	8.78E-01	2.61E-04	5.66E-01
ATK-LL130	1A, 2B, 4C, 6E	0.001	0.001	941	4.27E+05	10.0	3.00E-05	1.28E+01	3.76E-02	3.01E-05	2.09E-01
ATK-LL131	1A, 2B, 4C, 6E	0.100	0.021	1570	7.13E+05	415.8	1.25E-03	8.90E+02	2.61E+00	1.25E-03	3.49E-01
ATK-LL132	1A, 2B, 4C, 6E	0.001	0.001	1870	8.49E+05	10.0	3.00E-05	2.55E+01	7.47E-02	3.01E-05	4.16E-01
ATK-LL133	RQ-Asbestos	0.004	0.002	1836	8.34E+05	10.0	3.00E-05	2.50E+01	7.33E-02	3.01E-05	4.09E-01
ATK-LL134	1A, 2B, 4D, 6C	0.004	0.002	1044	4.74E+05	10.0	3.00E-05	1.42E+01	4.17E-02	3.01E-05	2.32E-01
ATK-LL135	1A, 2B, 4D, 6C	0.001	0.001	1143	5.19E+05	10.0	3.00E-05	1.56E+01	4.57E-02	3.01E-05	2.54E-01
ATK-LL136	1A, 2B, 4D, 6C	0.001	0.001	853	3.87E+05	10.0	3.00E-05	1.16E+01	3.41E-02	3.01E-05	1.90E-01
ATK-LL137	1A, 2B, 4D, 6C	0.095	0.018	890	4.04E+05	365.9	1.10E-03	4.44E+02	1.30E+00	1.10E-03	1.98E-01
ATK-LL138	1A, 2B, 4D, 6C	0.001	0.001	1095	4.97E+05	10.0	3.00E-05	1.49E+01	4.37E-02	3.01E-05	2.44E-01
ATK-LL139	1A, 2B, 4D, 6C	0.250	0.046	967	4.39E+05	914.8	2.75E-03	1.21E+03	3.53E+00	2.76E-03	2.15E-01
ATK-LL140	1A, 2B, 4D, 6C	0.005	0.002	876	3.98E+05	10.0	3.00E-05	1.19E+01	3.50E-02	3.01E-05	1.95E-01
ATK-LL141	1A, 2B, 4D, 6C	0.008	0.003	849	3.85E+05	59.9	1.80E-04	6.93E+01	2.03E-01	1.80E-04	1.89E-01
ATK-LL142	1A, 2B, 4D, 6C	0.008	0.006	1121	5.09E+05	109.8	3.30E-04	1.68E+02	4.92E-01	3.31E-04	2.49E-01
ATK-LL143	1A, 2B, 4D, 6C	0.025	0.007	2697	1.22E+06	133.1	4.00E-04	4.89E+02	1.43E+00	4.01E-04	6.00E-01
ATK-LL144	1A, 2B, 4D, 6C	0.001	0.001	2094	9.51E+05	10.0	3.00E-05	2.85E+01	8.36E-02	3.01E-05	4.66E-01
ATK-LL145	1A, 2B, 4D, 6C	0.001	0.001	2042	9.27E+05	10.0	3.00E-05	2.78E+01	8.16E-02	3.01E-05	4.54E-01

Container ID	Content/Size Code	Dose Rate mR/Hr		Net Weight		U238 SpA	U238 Fw	U238 Mass	U235 Mass	DU Fw	Pkg
		Contact	Average	Lbs	Grams	pCi/gm		gm	gm		Density
ATK-LL146	1A, 2B, 4D, 6C	0.002	0.001	1550	7.04E+05	10.0	3.00E-05	2.11E+01	6.19E-02	3.01E-05	3.45E-01
ATK-LL147	RQ-Asbestos	0.001	0.001	1401	6.36E+05	10.0	3.00E-05	1.91E+01	5.60E-02	3.01E-05	3.12E-01
ATK-LL148	1A, 2B, 4D, 6C	0.001	0.001	1328	6.03E+05	10.0	3.00E-05	1.81E+01	5.30E-02	3.01E-05	2.96E-01
ATK-LL149	1A, 2B, 4D, 6C	0.001	0.001	1238	5.62E+05	10.0	3.00E-05	1.69E+01	4.95E-02	3.01E-05	2.76E-01
ATK-LL150	1A, 2B, 4D, 6C	0.004	0.004	879	3.99E+05	79.8	2.40E-04	9.57E+01	2.80E-01	2.40E-04	1.96E-01
ATK-LL151	1A, 2B, 4D, 6C	0.001	0.001	1224	5.56E+05	10.0	3.00E-05	1.67E+01	4.89E-02	3.01E-05	2.72E-01
ATK-LL152	1A, 2B, 4D, 6C	0.002	0.002	1319	5.99E+05	10.0	3.00E-05	1.80E+01	5.27E-02	3.01E-05	2.94E-01
ATK-LL153	1A, 2B, 4D, 6C	0.001	0.001	1065	4.84E+05	10.0	3.00E-05	1.45E+01	4.25E-02	3.01E-05	2.37E-01
ATK-LL154	1A, 2B, 4D, 6C	0.001	0.001	1004	4.56E+05	10.0	3.00E-05	1.37E+01	4.01E-02	3.01E-05	2.23E-01
ATK-LL155	1A, 2B, 4D, 6C	0.001	0.001	1161	5.27E+05	10.0	3.00E-05	1.58E+01	4.64E-02	3.01E-05	2.58E-01
ATK-LL156	1A, 2B, 4D, 6C	0.001	0.001	1080	4.90E+05	10.0	3.00E-05	1.47E+01	4.31E-02	3.01E-05	2.40E-01
ATK-LL157	1A, 2B, 4D, 6C	0.001	0.001	944	4.29E+05	10.0	3.00E-05	1.29E+01	3.77E-02	3.01E-05	2.10E-01
ATK-LL158	1A, 2B, 4D, 6C	0.001	0.001	939	4.26E+05	10.0	3.00E-05	1.28E+01	3.75E-02	3.01E-05	2.09E-01
ATK-LL159	1A, 2B, 4D, 6C	0.001	0.001	1425	6.47E+05	10.0	3.00E-05	1.94E+01	5.69E-02	3.01E-05	3.17E-01
ATK-LL160	1A, 2B, 4D, 6C	0.001	0.001	1252	5.68E+05	10.0	3.00E-05	1.71E+01	5.00E-02	3.01E-05	2.79E-01
ATK-LL161	1A, 2B, 4D, 6C	0.001	0.001	717	3.26E+05	10.0	3.00E-05	9.78E+00	2.86E-02	3.01E-05	1.60E-01
ATK-LL162	1A, 2B, 4D, 6C	0.001	0.001	1295	5.88E+05	10.0	3.00E-05	1.77E+01	5.17E-02	3.01E-05	2.88E-01
ATK-LL163	1A, 2B, 4D, 6C	0.001	0.001	1124	5.10E+05	10.0	3.00E-05	1.53E+01	4.49E-02	3.01E-05	2.50E-01
ATK-LL164	1A, 2B, 4D, 6C	0.001	0.001	1378	6.26E+05	10.0	3.00E-05	1.88E+01	5.50E-02	3.01E-05	3.07E-01
ATK-LL165	1A, 2B, 4D, 6C	0.001	0.001	1434	6.51E+05	10.0	3.00E-05	1.96E+01	5.73E-02	3.01E-05	3.19E-01
ATK-LL166	1A, 2B, 4D, 6C	0.001	0.001	1474	6.69E+05	10.0	3.00E-05	2.01E+01	5.89E-02	3.01E-05	3.28E-01
ATK-LL167	1A, 2B, 4D, 6C	0.001	0.001	1232	5.59E+05	10.0	3.00E-05	1.68E+01	4.92E-02	3.01E-05	2.74E-01
ATK-LL168	1A, 2B, 4D, 6C	0.001	0.001	1349	6.12E+05	10.0	3.00E-05	1.84E+01	5.39E-02	3.01E-05	3.00E-01
ATK-LL169	1A, 2B, 4D, 6C	0.001	0.001	1902	8.64E+05	10.0	3.00E-05	2.59E+01	7.60E-02	3.01E-05	4.23E-01
ATK-LL170	1A, 2B, 4D, 6C	0.003	0.003	1761	7.99E+05	59.9	1.80E-04	1.44E+02	4.21E-01	1.80E-04	3.92E-01
ATK-LL171	1A, 2B, 4D, 6C	0.001	0.001	2006	9.11E+05	10.0	3.00E-05	2.73E+01	8.01E-02	3.01E-05	4.46E-01
ATK-LL172	1A, 2B, 4D, 6C	0.001	0.001	1561	7.09E+05	10.0	3.00E-05	2.13E+01	6.24E-02	3.01E-05	3.47E-01
ATK-LL173	1A, 2B, 4D, 6C	0.001	0.001	1331	6.04E+05	10.0	3.00E-05	1.81E+01	5.32E-02	3.01E-05	2.96E-01
ATK-LL174	1A, 2B, 4D, 6C	0.001	0.001	1715	7.79E+05	10.0	3.00E-05	2.34E+01	6.85E-02	3.01E-05	3.82E-01
ATK-LL175	1A, 2B, 4D, 6C	0.001	0.001	1023	4.64E+05	10.0	3.00E-05	1.39E+01	4.09E-02	3.01E-05	2.28E-01
ATK-LL176	1A, 2B, 4D, 6C	0.001	0.001	1778	8.07E+05	10.0	3.00E-05	2.42E+01	7.10E-02	3.01E-05	3.96E-01
ATK-LL177	1A, 2B, 4D, 6C	0.001	0.001	1219	5.53E+05	10.0	3.00E-05	1.66E+01	4.87E-02	3.01E-05	2.71E-01
ATK-LL178	1A, 2B, 4D, 6C	0.001	0.001	2139	9.71E+05	10.0	3.00E-05	2.92E+01	8.54E-02	3.01E-05	4.76E-01
ATK-LL179	1A, 2B, 4D, 6C	0.001	0.001	1285	5.83E+05	10.0	3.00E-05	1.75E+01	5.13E-02	3.01E-05	2.86E-01
ATK-LL180	1A, 2B, 4D, 6C	0.001	0.001	1397	6.34E+05	10.0	3.00E-05	1.90E+01	5.58E-02	3.01E-05	3.11E-01
ATK-LL181	1A, 2B, 4D, 6C	0.001	0.001	1138	5.17E+05	10.0	3.00E-05	1.55E+01	4.55E-02	3.01E-05	2.53E-01
ATK-LL182	1A, 2B, 4D, 6C	0.001	0.001	1359	6.17E+05	10.0	3.00E-05	1.85E+01	5.43E-02	3.01E-05	3.02E-01
ATK-LL183	1A, 2B, 4D, 6C	0.001	0.001	1546	7.02E+05	10.0	3.00E-05	2.11E+01	6.18E-02	3.01E-05	3.44E-01
ATK-LL184	1A, 2B, 4D, 6C	0.001	0.001	1546	7.02E+05	10.0	3.00E-05	2.11E+01	6.18E-02	3.01E-05	3.44E-01
ATK-LL185	1A, 2B, 4D, 6C	0.001	0.001	668	3.03E+05	10.0	3.00E-05	9.11E+00	2.67E-02	3.01E-05	1.49E-01
ATK-LL186	1A, 2B, 4D, 6C	0.001	0.001	1903	8.64E+05	10.0	3.00E-05	2.59E+01	7.60E-02	3.01E-05	4.24E-01
ATK-LL187	1A, 2B, 4D, 6C	0.001	0.001	978	4.44E+05	10.0	3.00E-05	1.33E+01	3.91E-02	3.01E-05	2.18E-01
ATK-LL188	1A, 2B, 4D, 6C	0.001	0.001	2052	9.32E+05	10.0	3.00E-05	2.80E+01	8.20E-02	3.01E-05	4.57E-01
ATK-LL189	1A, 2B, 4D, 6C	0.001	0.001	2153	9.77E+05	10.0	3.00E-05	2.94E+01	8.60E-02	3.01E-05	4.79E-01
ATK-LL190	1A, 2B, 4D, 6C	0.001	0.001	2745	1.25E+06	10.0	3.00E-05	3.74E+01	1.10E-01	3.01E-05	6.11E-01
ATK-LL191	1A, 2B, 4D, 6C	0.001	0.001	1035	4.70E+05	10.0	3.00E-05	1.41E+01	4.13E-02	3.01E-05	2.30E-01
ATK-LL192	1A, 2B, 4D, 6C	0.001	0.001	1470	6.67E+05	10.0	3.00E-05	2.00E+01	5.87E-02	3.01E-05	3.27E-01
ATK-LL193	1A, 2B, 4D, 6C	0.001	0.001	2660	1.21E+06	10.0	3.00E-05	3.63E+01	1.06E-01	3.01E-05	5.92E-01
ATK-LL194	1A, 2B, 4D, 6C	0.001	0.001	1400	6.36E+05	10.0	3.00E-05	1.91E+01	5.59E-02	3.01E-05	3.12E-01
ATK-LL195	1A, 2B, 4D, 6C	0.001	0.001	1339	6.08E+05	10.0	3.00E-05	1.83E+01	5.35E-02	3.01E-05	2.98E-01
ATK-LL196	1A, 2B, 4D, 6C	0.060	0.013	1345	6.11E+05	266.1	7.99E-04	4.88E+02	1.43E+00	8.02E-04	2.99E-01
ATK-LL197	1A, 2B, 4D, 6C	0.001	0.001	730	3.31E+05	10.0	3.00E-05	9.95E+00	2.92E-02	3.01E-05	1.62E-01
ATK-LL198	1A, 2B, 4D, 6C	0.001	0.001	1350	6.13E+05	10.0	3.00E-05	1.84E+01	5.39E-02	3.01E-05	3.00E-01
ATK-LL199	1A, 2B, 4D, 6C	0.001	0.001	1369	6.22E+05	10.0	3.00E-05	1.87E+01	5.47E-02	3.01E-05	3.05E-01
ATK-LL200	Soil, Rocks	0.001	0.001	3410	1.55E+06	10.0	3.00E-05	4.65E+01	1.36E-01	3.01E-05	7.59E-01
ATK-LL201	Soil, Rocks	0.001	0.001	3316	1.51E+06	10.0	3.00E-05	4.52E+01	1.32E-01	3.01E-05	7.38E-01
ATK-LL202	Soil, Rocks	0.001	0.001	5344	2.43E+06	10.0	3.00E-05	7.29E+01	2.13E-01	3.01E-05	1.19E+00
ATK-LL203	Soil, Rocks	0.001	0.001	5854	2.66E+06	10.0	3.00E-05	7.98E+01	2.34E-01	3.01E-05	1.30E+00
ATK-LL204	RQ-Asbestos	0.001	0.001	2248	1.02E+06	10.0	3.00E-05	3.06E+01	8.98E-02	3.01E-05	5.00E-01
ATK-LL205	1A, 2B, 4D, 6C	0.001	0.001	934	4.24E+05	10.0	3.00E-05	1.27E+01	3.73E-02	3.01E-05	2.08E-01
ATK-LL206	1A, 2B, 4D, 6C	0.001	0.001	654	2.97E+05	10.0	3.00E-05	8.92E+00	2.61E-02	3.01E-05	1.46E-01
ATK-LL207	1A, 2B, 4D, 6C	0.001	0.001	1375	6.24E+05	10.0	3.00E-05	1.87E+01	5.49E-02	3.01E-05	3.06E-01
ATK-LL208	1A, 2B, 4D, 6C	0.001	0.001	752	3.41E+05	10.0	3.00E-05	1.03E+01	3.00E-02	3.01E-05	1.67E-01
ATK-LL209	1A, 2B, 4D, 6C	0.180	0.035	1004	4.56E+05	698.6	2.10E-03	9.56E+02	2.80E+00	2.10E-03	2.23E-01
ATK-LL210	1A, 2B, 4D, 6C	0.001	0.001	1241	5.63E+05	10.0	3.00E-05	1.69E+01	4.96E-02	3.01E-05	2.76E-01

Container ID	Content/Size Code	Dose Rate mR/Hr		Net Weight		U238 SpA	U238 Fw	U238 Mass	U235 Mass	DU Fw	Pkg
		Contact	Average	Lbs	Grams	pCi/gm		gm	gm		Density
ATK-LL211	1A, 2B, 4D, 6C	0.001	0.001	1191	5.41E+05	10.0	3.00E-05	1.62E+01	4.76E-02	3.01E-05	2.65E-01
ATK-LL212	RQ-Asbestos	0.001	0.001	1664	7.55E+05	10.0	3.00E-05	2.27E+01	6.65E-02	3.01E-05	3.70E-01
ATK-LL213	RQ-Asbestos	0.001	0.001	1309	5.94E+05	10.0	3.00E-05	1.78E+01	5.23E-02	3.01E-05	2.91E-01
ATK-LL214	1A, 2B, 4D, 6C	0.001	0.001	914	4.15E+05	10.0	3.00E-05	1.25E+01	3.65E-02	3.01E-05	2.03E-01
ATK-LL215	1A, 2B, 4D, 6C	0.001	0.001	939	4.26E+05	10.0	3.00E-05	1.28E+01	3.75E-02	3.01E-05	2.09E-01
ATK-LL216	1A, 2B, 4D, 6C	0.001	0.001	1011	4.59E+05	10.0	3.00E-05	1.38E+01	4.04E-02	3.01E-05	2.25E-01
ATK-LL217	1A, 2B, 4D, 6C	0.001	0.001	748	3.40E+05	10.0	3.00E-05	1.02E+01	2.99E-02	3.01E-05	1.66E-01
ATK-LL218	RQ-Asbestos	0.003	0.001	2075	9.42E+05	10.0	3.00E-05	2.83E+01	8.29E-02	3.01E-05	4.62E-01
ATK-LL219	1A, 2B, 4F	0.001	0.001	1655	7.51E+05	10.0	3.00E-05	2.26E+01	6.61E-02	3.01E-05	3.68E-01
ATK-LL220	1A, 2B, 4F	0.001	0.001	1338	6.07E+05	10.0	3.00E-05	1.82E+01	5.34E-02	3.01E-05	2.98E-01
ATK-LL221	1A, 2B, 4F	0.001	0.001	1239	5.63E+05	10.0	3.00E-05	1.69E+01	4.95E-02	3.01E-05	2.76E-01
ATK-LL222	1A, 2B, 4F	0.001	0.001	1310	5.95E+05	10.0	3.00E-05	1.79E+01	5.23E-02	3.01E-05	2.92E-01
ATK-LL223	1A, 2B, 4F	0.001	0.001	967	4.39E+05	10.0	3.00E-05	1.32E+01	3.86E-02	3.01E-05	2.15E-01
ATK-LL224	1A, 2B, 4F	0.010	0.003	1238	5.62E+05	66.5	2.00E-04	1.12E+02	3.29E-01	2.00E-04	2.76E-01
ATK-LL225	1A, 2B, 4F	0.010	0.003	884	4.01E+05	66.5	2.00E-04	8.02E+01	2.35E-01	2.00E-04	1.97E-01
ATK-LL226	RQ-Asbestos	0.001	0.001	1676	7.61E+05	10.0	3.00E-05	2.28E+01	6.70E-02	3.01E-05	3.73E-01
ATK-LL227	1A, 2B, 4F	0.009	0.005	1021	4.64E+05	96.5	2.90E-04	1.34E+02	3.93E-01	2.91E-04	2.27E-01
Total:					1.58E+08			7.06E+04	2.07E+02	9.73E-02	3.65E-01

Weight % DU for waste stream: 4.49E-04

WASTE ACCEPTANCE CRITERIA

Section 1 – Purpose and Scope

These Radioactive Waste Acceptance Criteria establish the basis for acceptance of low-level and mixed radioactive waste materials at the Waste Control Specialists, LLC (WCS) Andrews Facility in Andrews County, Texas. The following types of radioactive waste may be accepted at the WCS facility for processing and interim storage, and, in some cases, disposal at exempt levels:

Low-Level RadioactiveWaste (LLRW). Radioactive waste material not classified as high-level waste, spent nuclear fuel, transuranic (TRU) waste, uranium mill tailings, or mixed waste. LLRW can include byproduct, source, and special nuclear material, natural occurring and accelerator produced radioactive material (NARM), or sealed sources.

Mixed Waste (MW). LLRW containing both radioactive and hazardous or toxic components as defined by the Atomic Energy Act (AEA), the Resource Conservation and Recovery Act (RCRA), and the Toxic Substances Control Act (TSCA). Non-AEA radioactive material mixed with RCRA or TSCA waste can also be accepted at WCS.

Natural Occurring Radioactive Material (NORM). Radioactive material resulting from natural sources that contain any nuclide that is radioactive in its natural physical state (i.e., not man-made). This includes NORM which may have been technologically enhanced (the chemical properties or physical state of natural sources of radiation have been altered or the potential exposure pathways to humans have been altered).

Source Material. Uranium or thorium, or any combination thereof, in any physical or chemical form; or ores that contain by weight 0.05% or more of uranium, thorium, or any combination thereof.

Special Nuclear Materials (SNM). Fissionable radioactive material in quantities not sufficient to form a critical mass as defined in 25 TAC 289.201(b)(102). (U-235 < 350 grams, U-233 or plutonium < 200 grams, or any combination) Sum of the fractions apply.

Non-radioactive hazardous waste (regulated under RCRA and TSCA) can also be accepted from approved generators for processing, storage and disposal at the WCS Facility; however, the criteria and procedures for acceptance of non radioactive hazardous waste is not within the scope of this document. Contact the Facility Manager at 888-789-2783 for additional information.

For questions regarding this waste acceptance criteria document or any other questions regarding WCS radioactive waste management capabilities, contact William Dornsife (Vice President Nuclear Affairs) at 888-492-7552 or 717-540-5220 or other designated WCS staff at 888-789-2783.

These criteria have been established to ensure that State of Texas, U.S. Department of Transportation (DOT), U.S. Nuclear Regulatory Commission (NRC), U.S. Environmental

Approval:

Original Signed by W. Dornsife	9/18/00	
Vice President Nuclear Affairs	Date	
Original signed by S. Nicholson	9/11/00	Original signed by D. Kania
Vice President Operations	Date	Radiation Safety Officer
Date		

Protection Agency (EPA) and local government requirements are met, and to satisfy operational requirements at the WCS facility.

Section 2 - Procedures for Shipping Waste to the WCS Andrews Facility

The WCS waste acceptance criteria, characterization, and certification requirements apply to all generators and waste collectors shipping radioactive waste to the WCS Andrews Facility. All packages will be evaluated for compliance with the acceptance criteria, and any additional requirements established by WCS and its regulators. Waste may not be shipped to the WCS Facility until the shipment is authorized by WCS. The steps involved in this process include:

1. Contact the WCS Nuclear Department at 888-492-7552, to discuss contract and pricing topics.

2. Submit a waste profile sheet to WCS providing information about the generator, the waste to be shipped, and assurances that the requirements in this document will be satisfied. The waste profile (Appendix A, or equivalent) must be submitted and approved by WCS prior to receipt of waste.

3. WCS will review this information, may conduct generator/broker site visits as needed to verify characterization and certification processes, and approve or reject the generator/collectors radioactive waste based on the information submitted and provide an authorization to ship letter.

4. Shipment must be scheduled at least 72 hours prior to arrival at the site using the shipment scheduling form. Contact the shipment scheduler at (505) 394-4300.

5. A completed manifest is requested to be submitted to the WCS Customer Service Representative 72 hours prior to arrival of the shipment at the facility. Advance copies of the manifest will allow for quicker acceptance at the site. Please contact the Waste Shipment Specialist at (505) 394-4300 or (505) 394-3427.

Section 3 - Radioactive and Mixed Waste Acceptance Criteria

This section identifies acceptance criteria for contaminant levels, waste packaging and form restrictions for all radioactive and mixed waste accepted at the WCS facility for processing, interim storage, disposal, and for waste resulting from WCS processing operations.

3.1 - General Packaging and Waste Form Acceptance Criteria for All Radioactive and Mixed Waste

1. Waste packages must meet all applicable provisions of USDOT regulations in 49 CFR Parts 170-178 and USNRC regulations in 10 CFR 71. Applicable State of Texas regulations for waste receipt, notification, labeling and manifesting include 25 TAC 289 (jj) and 25 TAC 289 (ggg) (4).

2. Mixed waste (MW) shall meet applicable USDOT and USEPA regulatory requirements for the hazardous and/or toxic components in addition to meeting regulatory requirements for radioactive materials. Limited quantity MW must be classified according to requirements for hazardous material as defined by Title 49 CFR 173.2.

3. Waste containing multiple hazards shall be packaged according to the level of hazard as defined in Title 49 CFR 173.2, "Classification of Material Having More than One Hazard." Incompatible MW shall be packaged in accordance with Title 40 CFR 264.177, "Special Requirements for Incompatible Wastes." Incompatible wastes may not be packaged together.

4. Waste packages shall be provided with lifting devices. Acceptable devices include pallets, skids, cleats, offsets, rings, handles, or other auxiliary lifting devices to allow handling by means of forklifts, cranes, or similar handling equipment. Lifting rings and other auxiliary lifting devices on the package are permissible, provided they are recessed, offset, or hinged in a manner that does not inhibit stacking the packages or they may be sheared/destroyed during transfer by WCS. The lifting devices must be designed to a 5:1 safety factor based on the ultimate strength of the material. All rigging devices that are not permanently attached to the waste package must have a current load test based on 125 percent of the safe working load. This does not apply to shipments of bulk material.

5. All DOT packages should include a closure device that is sturdy enough so that it will not be breached under normal handling conditions and will not serve as a weak point for package failure.

   All waste packages shall be loaded as efficiently and compactly as practical to maximize utilization of interior volume. With the agreement of the generator, WCS can consolidate and repackage waste that is not optimally loaded prior to placing into interim storage.

6. Waste containing pathogens, infectious wastes, biological material, explosives, organic peroxide, or other etiologic agents as defined in Title 49 CFR 173.134 will not be accepted.

7. Waste containing hazardous or toxic substances must be treated in accordance with all applicable State of Texas and USEPA requirements prior to disposal, or WCS can perform these necessary treatment services with customer approval.

8. The generator shall take the following precautions to protect the waste package after closure prior to shipment:

   - The preshipment storage environment shall be controlled to avoid adverse influence from weather or other factors on the containment capability of the waste packaging during handling, storage, and transport.

- Each waste package shall be prepared for shipment so as to minimize damage during transit. Damage or contamination incurred during transit will be the responsibility of the generator, and will have to be suitably repaired prior to acceptance.

- The requirements of Title 40 CFR 264, Subpart I, "Use and Management of Containers" shall be met for all MW packages.

3.2 – Radionuclide Acceptance Criteria for Exempt Level Radioactive Material Disposal at WCS

Disposal may require NRC or Agreement State approval if the material has been licensed under the Atomic Energy Act. Contact William Dornsife (Vice President Nuclear Affairs) at 717-540-5220 or 888-492-7552 for details and assistance.

1. Source material (uranium or thorium) in any physical or chemical form, solution or alloy in which the source material is < 0.05% by weight. This translates to the following concentrations: Th-232 = 54.5 pCi/g, U-238 = 166.5 pCi/g, U(nat) = 355 pCi/g total uranium, Th(nat) = 110 pCi/g total thorium, and U(depleted) = 250 pCi/g total uranium.
2. Unrefined or unprocessed ores containing source material (U or Th).
3. Rare earth metals, compounds, mixtures, or products containing less than 0.25% by weight Th or U or any combination thereof.
4. Any finished product, part, or scrap containing metal thorium alloys with Th < 4% by weight.
5. Depleted U in counterweights installed in aircraft, rockets, projectiles, or missiles or used as a shielding material constituting part of any shipping container.
6. Self luminous products containing H^3, Kr^{85}, Pr^{147} manufactured under a specific license which authorizes the transfer to exempt persons.
7. Any other specific items exempted from licensing under 25 TAC 289.251 (c) or (d).
8. Naturally Occurring Radioactive Materials (NORM) containing any NORM radionuclide less than 150 pCi/gm (this includes any Uranium and Thorium radionuclides if not licensed or classified by the generator as source material) or technologically enhanced radium-226 or radium-228 at less than 30 pCi/gm, averaged over any 100 square meters in the first 15 centimeters of soil below the surface, provided the radon emanation rate is less than 20 picocuries per square meter per second. If containerized, the average concentration for the shipment must meet these same limits.

3.3 Additional acceptance criteria for disposal of exempt level material at WCS.

1. Waste shall contain no free-standing liquids.

2. For determination of whether the material meets the requirements of Section 3.2, the concentration may be averaged over the entire bulk of the waste if the material is soil or rubblized debris. Other waste streams, such as contaminated equipment, must receive site specific approval of the sampling and characterization methodology.

3.4 Acceptance Criteria for Interim Storage of LLRW at WCS

1. LLRW classified as Class A, B, C, or greater than C can be accepted for interim storage at WCS. NORM, TRU, sealed sources, and mixed waste will also be accepted on a case by case basis for interim storage. All LLRW must be received in a form that meets all acceptance criteria in Section 3.1 as well as the following, or can be treated by WCS to achieve an acceptable waste form. License inventory limits for various radionuclides are shown in Table 2.

2. Packages: All waste for interim storage shall be shipped in USDOT approved packages. Preferred containers include the following: 4 x 4 x 7 ft (1.2 x 1.2 x 2.1-m) or 4 x 2 x 7 ft(1.2 x 0.6 x 2.1 m) (WHL) boxes, 55-gallon (208-liter) drums, 85 gallon overpacks, B-25 boxes, and 195/215 liners. Other dimensions may be pre-approved by the WCS Facility Manager. Cardboard or fiberboard boxes will not be accepted for interim storage.

3. Strength: Except for bulk waste, waste packaged in steel drums, or SEALANDTM containers, the waste package (packaging and contents) shall be capable of supporting a uniformly distributed load of 4,000 lbs/ft2 (19528 kg/m2). This is required to support other waste packages during stacking operations.

4. LLRW accepted for storage at WCS's Facility shall not exhibit any characteristics of, or be listed as, hazardous waste as identified in Title 40 CFR 261 "Identification and Listing of Hazardous Waste." For information on hazardous waste storage services, contact the facility manager.

5. LLRW shall contain no free-standing or corrosive liquids. Waste containing liquids shall be processed to solidify the liquid using a sufficient quantity of absorbent materials to contain twice the volume of the liquid. In no case shall the liquid exceed 1 percent of the volume.

6. LLRW containing discrete radium (> 2 nCi/gm) shall be in the form of sealed sources and packaged in a 2R container, or its equivalent. The 2R container must be immobilized in concrete in the center of a second container. The second container must be a DOT approved container.

7. Compressed gases as defined by Title 49 CFR 173.300, including unpunctured aerosol cans, will not be accepted for interim storage at the WCS facility.

8. Where practical, LLRW shall be treated to reduce volume and provide a high degree of physically and chemically stability. Wastes shall not significantly react with the packaging during normal storage, shipping, and handling. Void spaces within the waste and between waste and its package shall be minimized to the extent practicable.

9. Waste containing chelating or complexing agents at concentrations greater than eight percent by weight will not be accepted at the WCS facility without special WCS approval.

10. Waste shall not be readily capable of detonation or of explosive decomposition or reaction at normal pressures and temperatures, or of explosive reaction with water.

11. Waste shall not contain, or be capable of generating, quantities of toxic gases, vapors, or fumes harmful to persons transporting, handling, or disposing of the waste.

12. Waste must not be pyrophoric. Pyrophoric materials contained in wastes shall be treated, prepared, and packaged to be nonflammable.

13. Wastes in a gaseous form shall be packaged at an absolute pressure that does not exceed 1.5 atmospheres at 20^{0}C. Total activity shall not exceed 100 curies (3.7 terabecquerels) per container.

3.5 Acceptance criteria for interim storage and disposal of Mixed Waste

The following additional criteria must be met for interim storage or disposal of mixed waste at WCS. Mixed waste must receive any required treatment prior to shipment, or arrangements made in advance for treatment at the WCS facility. EPA-approved methods must be used. To be accepted for disposal, waste containing RCRA components must meet requirements for exempt level radioactive material per section 3.2 of this procedure.

1. Waste with a hazardous component prohibited from land disposal under 40 CFR 268, "Land Disposal Restrictions," must be treated as specified under 40 CFR 268, Subpart D, "Treatment Standards," prior to disposal or interim storage.

1. Wastes must be identified by the most appropriate compatibility group listed in Title 40 CFR 264, Appendix V, "examples of Potentially Incompatible Waste," to ensure that incompatible wastes are not shipped or stored together. Incompatible MW shall be packaged in accordance with Title 40 CFR 264.177, "Special Requirements for Incompatible Wastes."
2. Residual liquids shall be mixed with absorbent or solidified so that free liquids are no longer observed. To demonstrate the absence of free liquids, the generator may be required to use EPA Test Method 9095 (Paint Filter Test) as described in "Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods." (EPA Publication No. SW-846).
3. The requirements of Title 40 CFR 264, Subpart I, "use and Management of Containers" shall be met for MW packages.

3.6 Acceptance criteria for interim storage or disposal of radioactive waste contaminated with PCB's

Polychlorinated Biphenyl (PCB) contaminated radioactive waste can be accepted for treatment-storage, storage, or disposal. (For disposal, it must also meet the requirements of Section 3.2.) Specific site approval is required to assure compliance with storage and disposal requirements. Refer to 40 CFR 761.60 and applicable Texas regulations for PCB disposal requirements. Generally, solids contaminated with any level of PCB's are acceptable for disposal, but liquids must be treated to less than 500 ppm for disposal at WCS.

3.7 Acceptance Criteria for Interim Storage and Disposal of Radioactive Contaminated Asbestos

Radioactive contaminated asbestos waste may be accepted by WCS with specific site approval.

1. All regulated asbestos that is friable or otherwise capable of giving off friable asbestos dust must be wetted with a water and surfactant mix and stored in two plastic bags whose combined thickness equals at least 6 mil. The plastic bags must be overpacked in a leak-resistant containers that meets applicable shipping requirements for the radioactive content of the material involved. Sharp edges and

corners within the package shall be padded or otherwise protected to prevent damage to the plastic inner wrap during handling and shipping. Since the asbestos must be wetted during abatement activities, an absorbent must be added to ensure compliance with the free liquid criteria for interim storage of LLRW.

2. All LLRW containing regulated asbestos shall be packaged, marked, and labeled in accordance with the requirements of 40 CFR 61.150.
3. Regulated asbestos waste must be segregated and packaged separately.
4. For disposal, it must also meet the requirements of Section 3.2.

3.8 Acceptance Criteria for Waste Accepted for Processing

LLRW and MW received for processing may be exempted from certain characterization and certification criteria required for waste destined for interim storage or disposal since the waste characteristics will be altered during processing. For waste processed at WCS, compliance with applicable Texas Department of Health (TDH), Texas Natural Resources Conservation Commission (TNRCC) and USDOT regulations will be the primary controlling acceptance criteria. Radioactive waste material processed by WCS will be certified as meeting waste acceptance criteria stated in this document prior to storage or disposal at the WCS facility, or prior to return to the generator or other authorized recipient. All waste accepted for processing will require site specific approval.

Section 4 Waste Classification

All LLRW received for processing, storage, or disposal must be classified in accordance with the requirements in 25 TAC (ggg)(4). Waste containing PCB material and/or asbestos shall be properly identified. Hazardous waste components shall be classified according to criteria in 40 CFR 261.13 and 268.

Section 5 Requirements for Characterization of Waste

All radioactive waste shipped to the WCS facility shall have its radioactivity content determined prior to shipment. The radionuclides present and the radioactivity levels shall be determined from nuclear assay, direct measurement, process knowledge, or any other approved method. (See NRC Low-Level Waste Licensing Branch Technical Position on Radioactive Waste Classification dated 5/83) This information is required to maintain WCS facility radioactive material inventory levels within Radioactive Material License limits issued by the TDH, Bureau of Radiation Control and to insure it meets the TNRCC permit requirements.

The concentration of a radionuclide may be determined by indirect methods such as use of scaling factors, which relate the inferred concentration of one radionuclide to another that is measured, or radionuclide material accountability, if there is reasonable assurance that the indirect methods can be correlated with actual measurements. The concentration of a radionuclide may be averaged over the volume of the waste or weight of the waste if the units are expressed as picocurie (becquerel) per gram.

For the purpose of demonstrating that exempt level radioactive material meets the requirements of Section 3.2 for disposal, a sampling and/or characterization plan/methodology

must be submitted with the waste profile (Appendix A) for site specific approval. For bulk soil or rubblized debris, a composite sample (or equivalent waste steam specific approved methodology) will normally be required for each 20 cubic yard volume of waste. For other waste streams, such as contaminated equipment, site specific approval of the sampling and characterization methodology is required.

Table 2 License inventory limits for interim storage at WCS for selected radionuclides

Nuclide	Halflife years	License Possession Limit (Ci)	Nuclide	Halflife years	License Possession Limit (Ci)
Ag-110M	0.69	20,000	Np-237	2140000	200
Am-241	433	200	P-32	0.0391	20,000
Am-243	7370	200	P-33	0.069	20,000
Ba-133	10.7	2000	Pb-210	22	2000
Ba-140	0.035	20,000	Pm-147	2.623	200,000
Be-7	0.146	200,000	Po-210	0.38	200
C-14	5730	200,000	Pu-238	87.4	200
Ca-45	0.447	200,000	Pu-239	24390	200
Cd-109	1.24	200,000	Pu-240	6600	200
Ce-139	0.377	20,000	Pu-241	14.3	200
Ce-141	0.089	200,000	Pu-242	376000	200
Ce-144	0.778	20,000	Ra-226	1602	200
Cf-252	2.65	200	Rb-86	0.05	200,000
Cl-36	307000	20,000	Ru-103	0.108	200,000
Cm-242	0.446	200	Ru-106	1.008	20,000
Cm-243	32	200	S-35	0.239	200,000
Cm-244	18.1	200	Sb-124	0.165	20,000
Co-57	0.742	200,000	Sb-125	2.73	20,000
Co-58	1.96	200,000	Sc-46	0.229	20,000
Co-60	5.258	20,000	Se-75	0.329	200,000
Cr-51	0.0762	200,000	Sn-113	0.315	20,000
Cs-134	2.06	20,000	Sr-85	0.179	200,000
Cs-137	30.2	20,000	Sr-89	0.1392	20,000
Eu-152	13.4	20,000	Sr-90	28.9	2000
Eu-154	8.2	2000	Ta-182	0.315	20,000
Eu-155	5	200,000	Tc-99	213000	200,000
Fe-55	2.7	200,000	Te-125m	0.1589	200,000
Fe-59	0.1233	200,000	Th-228	1.913	200
Gd-153	0.66	200,000	Th-230	78000	200
Ge-68	0.786	20,000	Th-232	1.4E+10	20,000
H-3	12.33	200,000	Th-234	0.066	2000
Hf-181	0.116	200,000	U (Nat.)	4.5E+09	20,000
I-125	0.1636	20,000	U-232	72	200
I-129	1.6E+07	20,000	U-233	159000	2000
I-131	0.0221	20,000	U-234	247000	2000
Ir-192	0.203	20,000	U-235	7.1E+08	20,000
Mn-54	0.8575	200,000	U-236	2.4E+07	2000
Na-22	2.601	200,000	U-238	4.5E+09	20,000
Nb-94	20000	2000	Y-88	0.292	20,000
Nb-95	0.962	200,000	Zn-65	0.6677	200,000
Ni-59	80000	200,000	Zr-95	0.175	20,000
Ni-63	92	200,000			

Appendix A Customer Information and Waste Profile Form (enclosed)

for Manifest:
9998 W. Hwy. 176
Andrews, TX 79714

Address:
9998 W. Hwy. 176
Eunice, NM 88231

WCS

Address:
1710 W. Broadway
Andrews, TX 79714

Ph #: (888) 789-2787
(505) 394-4300
Fax #: (505) 394-3427

Waste Profile Sheet

Sales Representative | Exhibit "B" | Profile Number

WCS EPA ID # TXD988088464 | WCS State ID/RCRA # HW-50358

Attachments: ☐ Chain of Custody ☐ MSDS ☐ Attachment for Radioactive Material (includes NORM/Exempt) ☐ Other
☒ RCRA Analytical ☒ Radiological Analytical **Representative Sample:** ☐ Yes ☒ No

List any unacceptable treatment methods: None

PO Required for Invoicing: ☒ Yes ☐ No

SECTION 1

Generator Name: Alliant Techsystems Inc.

Physical Address: Twin Cities Army Ammunition Plant, Bldg 502

City, State, Zip: Arden Hills, MN 55112

Technical Contact: Kent DeRoos
e-mail: kderoos@sec-tn.com

Phone #: 865-548-9912 **Fax #:** 651-639-3341

☒ Check if billing information is the same address.
Billing Company: Safety & Ecology Corporation

Mail Address: 2800 Solway Rd

City, State, Zip: Knoxville, TN 37931

Billing Contact: Sammy Jones
e-mail: sjones@sec-tn.com

Phone #: 865-251-2075 **Fax #:** 865-539-9868

Manifest Return Address: SEC Site Mgr c/o ATK, Inc. ,TCAAP Bldg 502, Arden Hills, MN 55112 - Copy to Mike Styvaert, 1 Rock Island Arsenal, Bldg 390 4th floor, SE Rock Island, IL 61299-6000

SECTION 2 Generator Regulatory Status

EPA ID#: MND000819268 **State ID#:** _____

☒ Industrial ☐ Municipal ☐ PST Waste ☐ Universal Waste ☐ SQG ☐ CESQG
☐ Oil & Gas Exempt ☐ Oil & Gas Non-Exempt

SECTION 3 General Description and Regulatory Information

Waste Name: Construction Debris, DAW, Soils mixed with DAW as Overpack
Process Generating Waste: Manufacture of Depleted Uranium Munitions

Is this a US EPA hazardous waste? ☐ Yes ☒ No **If yes, list all codes including all LDR subcategories-e.g. D003-cyanides (attach additional pages if necessary).** _____

State Waste Code #: _____

	YES	NO
TSCA Regulated for PCB's Concentration: 15000 solids	☒	☐
Asbestos Regulated Material (If yes, is material friable? ☒ Yes ☐ No)	☒	☐
Regulated Ozone Depleting Substance	☐	☒
Benzene NESHAP Regulated ☐ With Controls ☐ With Out Controls	☐	☒
Does non-debris waste requiring treatment Contain <85ppm Volatile Organic Compounds? (If yes, analysis may be required).	☐	☒
Does material contain any regulated UHC's	☐	☒

If yes, list: _____

	YES	NO
RCRA Exempt Waste (List Reference _____)		
Regulated Subpart CC Waste (VOC>500ppm)	☐	☒
Does waste contain sorbents (If yes, are sorbents biodegradable? ☐ Yes ☒ No)	☒	☐
Waste soil subject to LDR alternate treatment Standards	☐	☒
Waste debris subject to LDR alternate treatment Standards	☐	☒
Does debris contain <85ppm Volatile Organic Compounds?	☒	☐

SECTION 4 Waste Composition ☐ Percentage by Weight ☒ Percentage by Volume

Physical Composition	Actual/ Avg	Range		Physical Composition	Actual/ Avg	Range	
DAW	50%	40%	70%	soil	25%	10%	30%

						%	%
	%	%	%		%	%	%

Range Totals Must Be ≥ 100%

Waste Profile Number:

Metals ☐ TCLP ☐ Totals ☒ Generator's Knowledge ☐ ppm ☐ ppb			
Antimony:	Cadmium:	Selenium:	Mercury: _____
Arsenic:	Chromium:	Silver:	
Barium:	Lead:	Thallium:	☐ Mercury <260 ppm totals ☐ Mercury >260 ppm totals
Beryllium:	Nickel:	Zinc:	

Other Chemical Constituents:	☐ ppm ☐ ppb ☐ % by Wt. ☐ % by Vol.			
Bromine: _____%	Benzene :	☐ TCLP	☐ Totals	☐ Gen. Knowledge
Chlorine: _____%	:	☐ TCLP	☐ Totals	☐ Gen. Knowledge
Iodine: _____%	:	☐ TCLP	☐ Totals	☐ Gen. Knowledge
Cyanides: _____Total _____ Amenable _____Reactive	:	☐ TCLP	☐ Totals	☐ Gen. Knowledge
Sulfides: _____Total _____ Reactive	:	☐ TCLP	☐ Totals	☐ Gen. Knowledge
	Use attachment for additional chemical constituents.			

SECTION 5 Waste Characteristics		Flashpoint °F	pH	Turbidity	Viscosity	Fuel Value
Liquid _____%	# of Layers_____	_____ Actual	☐ 0-2	☐ Transparent	☐ Light (water)	☐ < 5, 000 BTU
Solid 100%	Color _____	☐ >200	☐ >2-4	☐ Translucent		
Sludge _____%	Odor _____	☐ >140-200	☒ >4-10	☐ Opaque	☐ Medium (syrup)	☐ 5,000-10,000 BTU
Debris 100%	Specific Gravity_____	☐ >100-140	☒ >10-12.4	☐ Other		
☒% by Weight ☐% by Volume	1.6Density	☐ <100	☐ >12.5-14	_____	☐ Heavy (tar)	☐ >10,000 BTU

Other Characteristics of Waste ☒ None Apply

Yes No		Yes No		Yes No	
☐ ☐	Oxidizer	☐ ☐	Dioxin Listed (Storage Only)	☐ ☐	Liquid Organic Peroxide (not acceptable)
☐ ☐	Explosive (not acceptable)	☐ ☐	Infectious or Etiological (not acceptable)	☐ ☐	Fuming/Smoking Waste
☐ ☐	Pyrophoric (not acceptable)	☐ ☐	Putrescible (not acceptable)	☐ ☐	Pressurized Gasses (other than aerosols, not acceptable)
☐ ☐	Water Reactive	☐ ☐	Autopolymerizable	☐ ☐	Solid Organic Peroxide

SECTION 6 Shipping Information DOT Shipping Name: _____

Hazard Class/Div. 7	ID# (UN/NA)_____	Packing Group (PG)_____	RQ Asbestos
☐ Soft Top Rolloff	☐ Vac Tanker	(Type: Fiber, Poly, Steel) ☐ 55 gal.	Quantity 120
☐ Hard Top Rolloff	☒ Cu Yd Box or Super Sack	☐ 30 gal.	Frequency one time
☒ Gondola	☐ Shrink Wrapped Pallet	☐ 15 gal.	Overpacked Drums: Type _____ Size _____
☐ Intermodal	☐ Consumer Packaging	☐ 5 gal.	
☐ Tanker	☐ B-25 ☐ B-12	☐ 1 gal.	

☒ Other, please specify: 48-60, 96 cubic foot lift liners inside each closed gondola. 187 or more lift liners. Those containing soils will have secondary poly liners and absorbents to mitigate liquifaction concerns.

SECTION 7 Certification

The information contained herein is based on ☒ generator's knowledge and/or ☒ analytical data. I hereby certify that the above and attached description is complete and accurate to the best of my knowledge and ability to determine that no deliberate or willful omissions of composition properties exists and that all known suspected hazards have been disclosed. I certify that the materials tested are representative of all materials described by this document.

Signature	Printed/Typed Name	Date

WASTE CONTROL SPECIALISTS LLC

Attachment to Waste Profile Sheet
For Radioactive Material

PROFILE #:

Check Appropriate Box: ☐ Storage Only ☐ Treatment/Disposal ☐ Treatment/3rd Party Disposal
☒ Direct Disposal ☐ Treatment/Return to Generator Disposal Site:

Radioactive Characteristics: ☐ Mixed ☒ Radioactive

Chemical Form: DU oxides on materials and in soils

Is material waste (Check one): ☒ Yes ☐ No

Is material exempt (Check one): ☒ Yes ☐ No (WAC Section 3.2.1)

If Waste, what waste class (Check one): ☒ A ☐ B ☐ C or ☐ >C
(see Title 10 CFR 61.55 and 25 TAC 289.202 (ggg)(4))

Is material NORM (Check one): ☐ Yes ☒ No

Is material source material (Check one): ☐ Yes ☒ No

If NORM radium, please indicate Radon emanation rate: _____ pCi/m²/sec

Grams of special nuclear material (Total for Profile): Pu 0.0 U-233 0.0 U-235 ____

Highest dose rate in mR/hr: On contact 0.490 At 1 ft. 0.420

Are the containers overpacked? (Check one): ☒ Yes ☐ No

Describe the packaging: 90% full, 96 cubic foot lift liners certified as IP-1

Radioactive Constituents:
List all radionuclides present in the waste, the concentration pCi/gm and the total activity in millicuries. (Attach additional sheets if necessary-please use the same table format as below.)

Nuclide	Concentration Range (pCi/gm) Min.	Max.	Avg.	Total Activity (mCi)

Ex-05
4

Generator's Certification:

The information contained herein is based on ☐ generator knowledge and/or ☐ analytical data. I hereby certify that the above and attached description is complete and accurate to the best of my knowledge and ability to determine that no deliberate or willful omissions of composition properties exist and that all known or suspected hazards have been disclosed. I certify that the materials tested are representative of all materials described by this document.

Authorized Signature:_____ **Date:**_____

Printed Name:_____ **Title:** _____

DOSE ASESSMENT FOR DISPOSAL OF TWIN CITIES ARMY AMMUNITION PLANT (TCAAP) WASTE CONTAINING LESS THAN 0.05 WT% SOURCE MATERIAL AT WCS ANDREWS FACILITY

1. INTRODUCTION

1) The following consists of analysis performed for the TCAAP waste stream as compared to data collected for the Lake City Army Ammunition Plant (LCAAP) waste stream. The LCAAP waste stream was approved for shipment as an unimportant quantity of source material in a letter from Mr. Stewart W. Brown, USNRC, dated March 26, 2001. (Attachment 1)

2) Based on the extremely small difference in the concentration of the isotopes between the two facilities (LCAAP and TCAAP), the resulting doses which were determined in the previously approved analysis for LCAAP are applicable to the source material from the TCAAP. The only difference is the mode of transportation of the waste. The TCAAP waste will be transported by truck whereas rail was used for the LCAAP waste. The following analysis will demonstrate that the shipment method results in a dose which is very low when compared to the NRC limits.

2. SAFETY ANALYSIS AND DOSE ASSESSMENT (EXCLUDING DOSE TO THE PUBLIC) FOR DISPOSAL OF TCAAP WASTE AT THE WCS ANDREWS FACILITY

2.1. SOURCE TERM

The TCAAP waste contains depleted uranium, but essentially no thorium or radium. Uranium is present as a result of depleted uranium munitions manufacturing conducted at TCAAP during the 1970's and 1980's. During decommissioning and characterization efforts, the Army confirmed that the isotope U-238 would comprise 87.7% of the total uranium activity. The remaining activity consists of approximately 10.7% U-234 and 1.6% U-235. Based on the site specific isotopic uranium ratio (68.1% U-238, 30.5% U-234, and 1.4% U-235), the unimportant quantity of source material threshold (i.e., less than 0.05% by weight) is 250 pCi/g. (All external dose calculations in this assessment were developed on the maximum allowed average (total uranium) concentration of 250 pCi/g and are worse case levels).

2.2. DOSE TO TRANSPORT PERSONNEL

The dose to the transport vehicle driver is calculated using MICROSHIELD and the TCAAP waste profile. 18 super-sack waste containers will be loaded into the cubic volume of the truck. This should measure 337.79 cm Length, 337.79 cm Width, 337.79 cm Height external dimensions and will hold 50 cy of waste. The driver is assumed to be 2 meters from the waste and requires 1 hour to load the truck. Transportation to the disposal cell is assumed to require 27 hours one way (the truck will be empty

on the return trip. Unloading time should take about 1 hour. The resulting dose is 7.837e-4 mrem/hr x (2 hours load & unload time + 27 hours travel time) per load. This yields a dose of 0.022 mrem per trip for the driver. Assuming 1 driver hauls the entire waste stream, 900 cy of waste, and 50 cy per load, the individual driver dose is calculated as follows:

$$\text{Dose}_{\text{WCS Driver}} = \frac{(7.837\text{e-}4 \text{ mrem/hr per load})(900 \text{ cy waste}) \times 29 \text{ hours}}{(1 \text{ Driver})(50 \text{ cy/load})} = 0.409 \text{ mrem}$$

3. CONCLUSIONS OF ANALYSES

The U.S. Army proposes to dispose of contaminated material from its TCAAP facility by transfer to the WCS Andrews facility. The Army will only transfer waste containing unimportant quantities of source material, i.e., less than 0.05 wt%. Estimates of individual and collective dose to members of the public and to WCS workers were made to evaluate the consequence of disposing similar waste and was performed as noted in Attachment 1. The dose estimate to the transport vehicle driver and to members of the public is very low when compared to the NRC limits. It has been concluded by all parties that the incurred dose from the TCAAP waste would be negligible.

Attachment 1

Letter Dated March 26, 2001 from Mr. Stewart W. Brown, USNRC

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

March 26, 2001

Ms. Rosalene E. Graham, Chief
Safety/Rad Waste Team
Department of the Army
U.S. Army Operations Support Command
1 Rock Island Arsenal
Rock Island, IL 61299-6000

SUBJECT: LAKE CITY ARMY AMMUNITION PLANT - DOSE ANALYSIS FOR DISPOSAL OF UNIMPORTANT QUANTITIES OF SOURCE MATERIAL AT WASTE CONTROL SPECIALISTS' ANDREWS FACILITY

Dear Ms. Graham:

In your letter dated December 21, 2000, you notified the U. S. Nuclear Regulatory Commission (NRC) that the Army planned to ship Lake City Army Ammunition Plant (LCAAP) radioactive waste to Waste Control Specialists' (WCS) Andrews Facility for disposal. The Army intends to ship this material to WCS under the provisions of Title 10, Code of Federal Regulation Paragraph 40.51(b)(4). Also, provided in this December 21, 2000, letter was a dose analysis for disposal of LCAAP unimportant quantities of source material at WCS. The dose analysis was later revised by letters dated March 1, March 13, and March 20, 2001. We have completed our review of Army's dose analysis and conclude that the analysis is adequate to demonstrate that the dose consequences of shipping and disposing of this waste material from LCAAP would be well within regulatory limits. Therefore, the NRC will not object to the shipment of this material as an unimportant quantity of source material.

If you have any questions, please do not hesitate to call me at (301) 415-6605.

Stewart W. Brown, Project Manager
Decommissioning Branch
Division of Waste Management
Office of Nuclear Material Safety
and Safeguards

OPTIONAL FORM 99 (7-90)

FAX TRANSMITTAL # of pages ▶ 1

To Sammy Jones	From MIKE STRUBLE
Dept./Agency SEC	Phone # (309) 782-0880
Fax # (651) 639-3341	Fax # 782-2988

NSN 7540-01-317-7368 5099-101 GENERAL SERVICES ADMINISTRATION

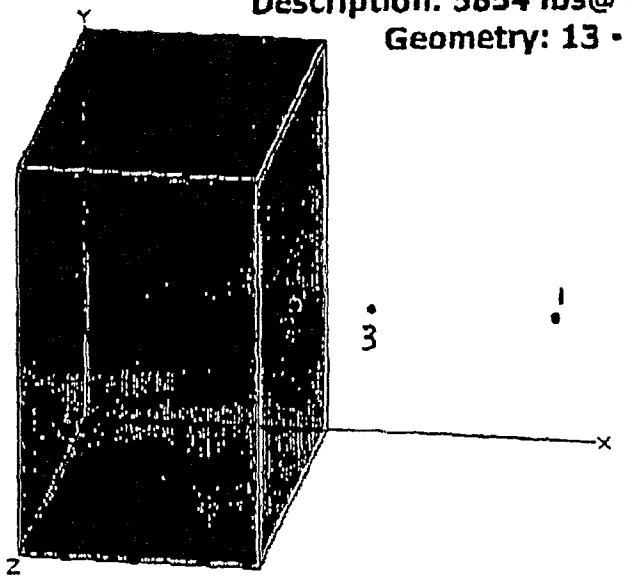
TOTAL P.01

MicroShield v5.05 (5.05-00553)
Safety_and_Ecology_Corporation

Page : 1
DOS File : HEAVYSAC.MS5
Run Date: November 27, 2002
Run Time: 1:11:04 PM
Duration : 00:00:56

File Ref: _____
Date: 12-5-02
By: [illegible]
Checked: _____

Case Title: Heavysack
Description: 5854 lbs@ 250 pci/gm, concrete matrix
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	91.4 cm	2 ft 12.0 in
Width	152.0 cm	4 ft 11.8 in
Height	152.0 cm	4 ft 11.8 in

Dose Points

	X	Y	Z
# 1	191 cm	76 cm	76 cm
	6 ft 3.2 in	2 ft 5.9 in	2 ft 5.9 in
# 2	92.4 cm	76 cm	76 cm
	3 ft 0.4 in	2 ft 5.9 in	2 ft 5.9 in
# 3	121.4 cm	76 cm	76 cm
	3 ft 11.8 in	2 ft 5.9 in	2 ft 5.9 in

Shields

Shield Name	Dimension	Material	Density
Source	2.11e+06 cm³	Concrete	1.257
Air Gap		Air	0.00122

Source Input
Grouping Method : Standard Indices
Number of Groups : 25
Lower Energy Cutoff : 0.015
Photons < 0.015 : Excluded
Library : Grove

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Pa-234m	4.5305e-004	1.6763e+007	2.1454e-004	7.9381e+000
Th-231	9.3138e-006	3.4461e+005	4.4106e-006	1.6319e-001
Th-234	4.5305e-004	1.6763e+007	2.1454e-004	7.9381e+000
U-234	1.3818e-004	5.1127e+006	6.5435e-005	2.4211e+000
U-235	9.3138e-006	3.4461e+005	4.4106e-006	1.6319e-001
U-238	4.5305e-004	1.6763e+007	2.1454e-004	7.9381e+000

Buildup
The material reference is : Source

Integration Parameters

Page : 2
DOS File : HEAVYSAC.MS5
Run Date: November 27, 2002
Run Time: 1:11:04 PM
Duration : 00:00:56

X Direction	20
Y Direction	20
Z Direction	20

Results - Dose Point # 1 - (191,76,76) cm

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	6.482e+02	1.089e-08	1.144e-08	9.339e-10	9.808e-10
0.03	5.049e+04	5.687e-05	6.821e-05	5.636e-07	6.760e-07
0.05	6.033e+03	3.556e-05	5.880e-05	9.474e-08	1.566e-07
0.06	6.568e+05	6.145e-03	1.237e-02	1.221e-05	2.458e-05
0.08	6.422e+04	1.090e-03	2.717e-03	1.725e-06	4.300e-06
0.1	1.051e+06	2.609e-02	7.218e-02	3.992e-05	1.104e-04
0.15	5.367e+04	2.415e-03	7.110e-03	3.977e-06	1.171e-05
0.2	2.127e+05	1.420e-02	4.103e-02	2.507e-05	7.242e-05
0.8	3.464e+04	1.569e-02	3.249e-02	2.984e-05	6.179e-05
1.0	1.614e+05	1.006e-01	1.968e-01	1.854e-04	3.628e-04
TOTALS:	2.292e+06	1.663e-01	3.648e-01	2.988e-04	6.488e-04

Results - Dose Point # 2 - (92.4,76,76) cm

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	6.482e+02	1.933e-08	2.043e-08	1.658e-09	1.753e-09
0.03	5.049e+04	2.280e-04	2.767e-04	2.260e-06	2.742e-06
0.05	6.033e+03	1.529e-04	2.543e-04	4.073e-07	6.775e-07
0.06	6.568e+05	2.668e-02	5.409e-02	5.299e-05	1.074e-04
0.08	6.422e+04	4.790e-03	1.207e-02	7.579e-06	1.910e-05
0.1	1.051e+06	1.154e-01	3.259e-01	1.765e-04	4.986e-04
0.15	5.367e+04	1.077e-02	3.289e-02	1.774e-05	5.416e-05
0.2	2.127e+05	6.368e-02	1.923e-01	1.124e-04	3.394e-04
0.8	3.464e+04	7.304e-02	1.609e-01	1.389e-04	3.060e-04
1.0	1.614e+05	4.728e-01	9.849e-01	8.715e-04	1.815e-03
TOTALS:	2.292e+06	7.675e-01	1.764e+00	1.380e-03	3.144e-03

Results - Dose Point # 3 - (121.4,76,76) cm

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	6.482e+02	1.777e-08	1.870e-08	1.524e-09	1.604e-09

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DOS File : HEAVYSAC.MS5
Run Date: November 27, 2002
Run Time: 1:11:04 PM
Duration : 00:00:56

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	5.049e+04	1.602e-04	1.933e-04	1.588e-06	1.916e-06
0.05	6.033e+03	1.013e-04	1.670e-04	2.698e-07	4.450e-07
0.06	6.568e+05	1.753e-02	3.513e-02	3.482e-05	6.978e-05
0.08	6.422e+04	3.121e-03	7.765e-03	4.939e-06	1.229e-05
0.1	1.051e+06	7.483e-02	2.080e-01	1.145e-04	3.182e-04
0.15	5.367e+04	6.945e-03	2.066e-02	1.144e-05	3.403e-05
0.2	2.127e+05	4.090e-02	1.197e-01	7.218e-05	2.112e-04
0.8	3.464e+04	4.561e-02	9.566e-02	8.675e-05	1.819e-04
1.0	1.614e+05	2.930e-01	5.802e-01	5.400e-04	1.069e-03
TOTALS:	2.292e+06	4.822e-01	1.067e+00	8.665e-04	1.899e-03

MicroShield v5.05 (5.05-00553)
Safety_and_Ecology_Corporation
Conversion of calculated exposure in air to dose
FILE: C:\MS5\DATA\HEAVYSAC.MS5
Case Title: Heavysack
This case was run on Wednesday, November 27, 2002 at 1:11:04 PM
Dose Point # 1 - (191,76,76) cm

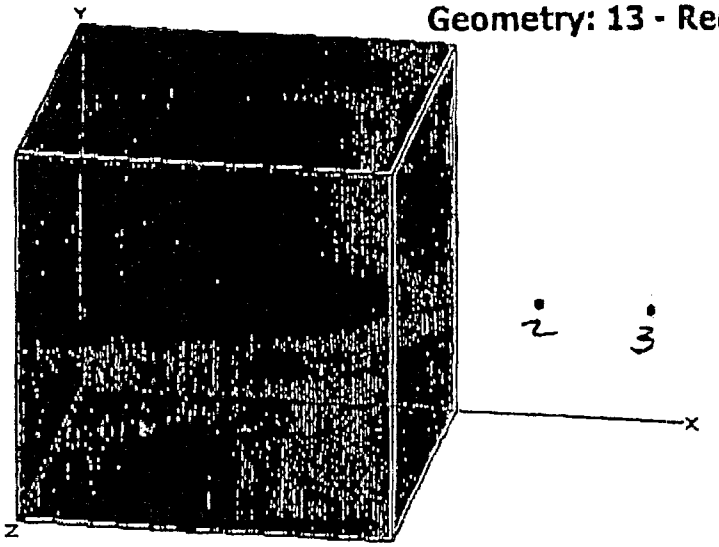
Results (Summed over energies)	Units	Without Buildup	With Buildup
Photon Fluence Rate (flux)	Photons/cm²/sec	5.869e-001	1.455e+000
Photon Energy Fluence Rate	MeV/cm²/sec	1.663e-001	3.648e-001
Exposure and Dose Rates:			
Exposure Rate in Air	mR/hr	2.988e-004	6.488e-004
Absorbed Dose Rate in Air	mGy/hr	2.608e-006	5.664e-006
"	mrad/hr	2.608e-004	5.664e-004
Deep Dose Equivalent Rate	(ICRP 51 - 1987)		
o Parallel Geometry	mSv/hr	3.320e-006	7.357e-006
o Opposed	"	2.475e-006	5.354e-006
o Rotational	"	2.469e-006	5.343e-006
o Isotropic	"	2.232e-006	4.850e-006
Shallow Dose Equivalent Rate	(ICRP 51 - 1987)		
o Parallel Geometry	mSv/hr	3.467e-006	7.643e-006
o Opposed	"	3.130e-006	6.837e-006
o Rotational	"	3.130e-006	6.837e-006
o Isotropic	"	2.382e-006	5.173e-006
Effective Dose Equivalent Rate	(ICRP 51 - 1987)		
o Anterior/Posterior Geometry	mSv/hr	2.918e-006	6.454e-006
o Posterior/Anterior	"	2.524e-006	5.536e-006
o Lateral	"	1.838e-006	3.978e-006
o Rotational	"	2.232e-006	4.881e-006
o Isotropic	"	1.902e-006	4.136e-006

MicroShield v5.05 (5.05-00553)
Safety_and_Ecology_Corporation

Page : 1
DOS File : HEAVYTRK.MS5
Run Date: November 27, 2002
Run Time: 1:42:25 PM
Duration : 00:01:01

File Ref: _____
Date: 12-5-02
By: [illegible]
Checked: _____

Case Title: Heavy truck
Description: 250 pci/gm concrete matrix, 50 cubic yds
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	336.79 cm	11 ft 0.6 in
Width	336.79 cm	11 ft 0.6 in
Height	336.79 cm	11 ft 0.6 in

Dose Points

	X	Y	Z
# 1	337.79 cm	160 cm	160 cm
	11 ft 1.0 in	5 ft 3.0 in	5 ft 3.0 in
# 2	436.79 cm	160 cm	160 cm
	14 ft 4.0 in	5 ft 3.0 in	5 ft 3.0 in
# 3	536.79 cm	160 cm	160 cm
	17 ft 7.3 in	5 ft 3.0 in	5 ft 3.0 in

Shields

Shield Name	Dimension	Material	Density
Source	3.82e+07 cm³	Concrete	1.26
Air Gap		Air	0.00122

Source Input
Grouping Method : Standard Indices
Number of Groups : 25
Lower Energy Cutoff : 0.015
Photons < 0.015 : Excluded
Library : Grove

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Pa-234m	8.1549e-003	3.0173e+008	2.1347e-004	7.8985e+000
Th-231	1.6765e-004	6.2031e+006	4.3886e-006	1.6238e-001
Th-234	8.1549e-003	3.0173e+008	2.1347e-004	7.8985e+000
U-234	2.4872e-003	9.2026e+007	6.5108e-005	2.4090e+000
U-235	1.6765e-004	6.2031e+006	4.3886e-006	1.6238e-001
U-238	8.1549e-003	3.0173e+008	2.1347e-004	7.8985e+000

Buildup
The material reference is : Source

Integration Parameters

Page : 2
DOS File : HEAVYTRK.MS5
Run Date: November 27, 2002
Run Time: 1:42:25 PM
Duration : 00:01:01

X Direction	20
Y Direction	20
Z Direction	20

Results - Dose Point # 1 - (337.79,160,160) cm

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.167e+04	1.129e-14	1.243e-14	9.688e-16	1.066e-15
0.03	9.089e+05	7.990e-05	1.091e-04	7.918e-07	1.081e-06
0.05	1.086e+05	1.342e-04	2.465e-04	3.575e-07	6.566e-07
0.06	1.182e+07	2.462e-02	5.400e-02	4.891e-05	1.073e-04
0.08	1.156e+06	4.559e-03	1.213e-02	7.215e-06	1.920e-05
0.1	1.893e+07	1.109e-01	3.251e-01	1.697e-04	4.974e-04
0.15	9.660e+05	1.045e-02	3.268e-02	1.721e-05	5.381e-05
0.2	3.828e+06	6.204e-02	1.911e-01	1.095e-04	3.374e-04
0.8	6.236e+05	7.224e-02	1.616e-01	1.374e-04	3.074e-04
1.0	2.906e+06	4.689e-01	9.927e-01	8.643e-04	1.830e-03
TOTALS:	4.126e+07	7.539e-01	1.770e+00	1.355e-03	3.154e-03

Results - Dose Point # 2 - (436.79,160,160) cm

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.167e+04	3.374e-12	3.672e-12	2.894e-13	3.150e-13
0.03	9.089e+05	7.163e-05	9.447e-05	7.099e-07	9.363e-07
0.05	1.086e+05	7.759e-05	1.344e-04	2.067e-07	3.579e-07
0.06	1.182e+07	1.359e-02	2.839e-02	2.700e-05	5.639e-05
0.08	1.156e+06	2.436e-03	6.173e-03	3.854e-06	9.769e-06
0.1	1.893e+07	5.858e-02	1.658e-01	8.963e-05	2.536e-04
0.15	9.660e+05	5.462e-03	1.662e-02	8.994e-06	2.737e-05
0.2	3.828e+06	3.227e-02	9.684e-02	5.695e-05	1.709e-04
0.8	6.236e+05	3.676e-02	7.979e-02	6.993e-05	1.518e-04
1.0	2.906e+06	2.374e-01	4.875e-01	4.377e-04	8.985e-04
TOTALS:	4.126e+07	3.867e-01	8.812e-01	6.949e-04	1.570e-03

Results - Dose Point # 3 - (536.79,160,160) cm

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.167e+04	2.730e-12	2.972e-12	2.341e-13	2.549e-13

Page : 3
DOS File : HEAVYTRK.MS5
Run Date: November 27, 2002
Run Time: 1:42:25 PM
Duration : 00:01:01

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	9.089e+05	4.347e-05	5.657e-05	4.308e-07	5.607e-07
0.05	1.086e+05	3.927e-05	6.697e-05	1.046e-07	1.784e-07
0.06	1.182e+07	6.840e-03	1.426e-02	1.359e-05	2.832e-05
0.08	1.156e+06	1.224e-03	3.114e-03	1.937e-06	4.928e-06
0.1	1.893e+07	2.945e-02	8.387e-02	4.506e-05	1.283e-04
0.15	9.660e+05	2.748e-03	8.414e-03	4.525e-06	1.386e-05
0.2	3.828e+06	1.624e-02	4.893e-02	2.867e-05	8.637e-05
0.8	6.236e+05	1.853e-02	4.016e-02	3.525e-05	7.639e-05
1.0	2.906e+06	1.197e-01	2.453e-01	2.206e-04	4.521e-04
TOTALS:	4.126e+07	1.948e-01	4.441e-01	3.501e-04	7.910e-04

MicroShield v5.05 (5.05-00553)
Safety_and_Ecology_Corporation
Conversion of calculated exposure in air to dose
FILE: C:\MS5\DATA\HEAVYTRK.MS5
Case Title: Heavy truck
This case was run on Wednesday, November 27, 2002 at 1:42:25 PM
Dose Point # 3 - (536.79,160,160) cm

Results (Summed over energies)	Units	Without Buildup	With Buildup
Photon Fluence Rate (flux)	Photons/cm²/sec	6.684e-001	1.715e+000
Photon Energy Fluence Rate	MeV/cm²/sec	1.948e-001	4.441e-001
Exposure and Dose Rates:			
Exposure Rate in Air	mR/hr	3.501e-004	7.910e-004
Absorbed Dose Rate in Air	mGy/hr	3.057e-006	6.905e-006
"	mrad/hr	3.057e-004	6.905e-004
Deep Dose Equivalent Rate	(ICRP 51 - 1987)		
o Parallel Geometry	mSv/hr	3.876e-006	8.925e-006
o Opposed	"	2.903e-006	6.533e-006
o Rotational	"	2.897e-006	6.521e-006
o Isotropic	"	2.617e-006	5.913e-006
Shallow Dose Equivalent Rate	(ICRP 51 - 1987)		
o Parallel Geometry	mSv/hr	4.051e-006	9.282e-006
o Opposed	"	3.667e-006	8.327e-006
o Rotational	"	3.667e-006	8.327e-006
o Isotropic	"	2.791e-006	6.307e-006
Effective Dose Equivalent Rate	(ICRP 51 - 1987)		
o Anterior/Posterior Geometry	mSv/hr	3.410e-006	7.837e-006
o Posterior/Anterior	"	2.956e-006	6.737e-006
o Lateral	"	2.158e-006	4.857e-006
o Rotational	"	2.615e-006	5.944e-006
o Isotropic	"	2.230e-006	5.043e-006

CALCULATION SHEET

DATE _____

DESIGNED BY _____ DATE _____ CHECKED BY _____ SHEET NO. _____

PROJECT _____ JOB NO. _____

SUBJECT _____ CALCULATION NO. _____ FILE NO. _____

SACK ρ = 1.257 g/cm^3

TRUCK ρ = 1.26 g/cm^3 (more buildup)

ASSUMPTIONS: No shielding between driver and load
Bremsstrahlung radiation contribution negligible
WAC LIMIT 250 pCi/gm Depl. U.

DOSE POINTS:
SACK – 1 meter point used for dose calcs
TRUCK – 2 meter point used for dose calcs.