Ingestion Pathway Consequences of an H-Separations Coil and Tube Failure

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Jay M. Thompson

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Abstract

The food ingestion consequences of an accidental release, scenario 1-RD-2.35, are evaluated for H-Separations. The sizes of land areas requiring the protective action of food interdiction are calculated. The consequences of the release are evaluated with the HOTSPOT model and an EXCEL spreadsheet.

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Ingestion Pathway Consequences of an H-Separations Coil and Tube Failure (U)

Introduction

Accidental releases of radionuclides from nuclear facilities may cause contamination of food and forage. Numerous pathways exist for deposited radionuclides to reach man. The major pathways considered by recent Food and Drug Administration guidance are analyzed in this report.

Approach

The general methodology for determining the limiting radionuclide group, Derived Response Level (DRL), and consequences for ingestion pathways is outlined below.

1. Determine the source terms (radionuclide-specific and total airborne releases).
2. If tritium is present in the source term, evaluate the consequences of the tritium release using UFOTRI. Tritium is not present in the source term of scenario 1-RD-2.35.
3. Calculate the concentrations of each radionuclide in foodstuffs for a unit deposition of the particulate mix.
4. For radionuclides with FDA (1998) Derived Intervention Levels (DILs), divide the DIL by the foodstuff concentration from a unit deposition. The Derived Response Level, or DRL, is the deposition that gives a DIL for a specific nuclide (group) and pathway.
5. Run the dispersion/deposition model HOTSPOT to determine areas impacted.

Background

FDA (1998) places selected radionuclides into five groups. These groups are:

- Sr-90
- I-131
- Cs-134 + Cs-137
- Pu-238 + Pu-239 + Am-241
- Ru-103 + Ru-106

Notes for Table 2 and Appendix D of FDA (1998) provide guidance on how to utilize these groups. The Derived Intervention Level (DIL) for each radionuclide group is applied independently (i.e., there is no additivity between groups). If multiple radionuclides are present in a group, the DIL applies to the sum of the concentrations of

those radionuclides. The DILs are applied to the wet weight of foods (as prepared for consumption).

These groups were developed to aid analyses at a variety of nuclear facilities. Nuclear waste storage facilities and nuclear fuel reprocessing facilities are expected to have Sr-90, Cs-137, Pu-239, and Pu-238 as major contributors (p. 51 of FDA 1998).

FDA recommends that DILs from the five groups be applied immediately following an accident. Early evaluation of other radionuclides that may have been released is not required. However, an evaluation should be performed as soon as possible to ensure the DILs are appropriate; presumably, this would include evaluating DILs for the five groups as well as those for radionuclides not in the groups.

The five radionuclide groups are not sufficient to cover accidents at all types of facilities or locations. FDA (1998) notes the example of transportation accidents that may release radionuclides not in the radionuclide groups. Although such releases are not specifically addressed (in the five groups), FDA recommends that an evaluation of the radiation dose from ingestion of these other radionuclides be performed to determine if protective action guides will be exceeded. Appendix E of FDA (1998) presents DILs for 15 additional radionuclides.

Some source terms at SRS are postulated to be dominated by tritiated water vapor. DILs for tritium in water vapor and organically bound forms were derived in WSRC-TR-99-00064 using methodology consistent with FDA (1998). The tritium-specific model UFOTRI is used to evaluate tritium releases. Tritium is not present in the source term of scenario 1-RD-2.35.

Analysis

For H-Separations, the source term for the Coil & Tube Release Scenario 1-RD-2.35 is evaluated. Respirable releases are the same as total releases for each radionuclide since the respirable fraction (RF) is 1.0 (S-CLC-G-00004, Sheet 6, section 3.2). S-CLC-G-00004 contains the source term calculations used ultimately in S-EHA-H-00004. The source terms are listed in Table 1.

Table 1. H-Separations airborne source term, 1-RD-2.35

Nuclide		Airborne Release (Ci)
Am	241	6.57E-01
Pu	238	1.62E+00
Pu	239	4.23E-03
Pu	240	2.43E-01
Pu	241	3.26E+01
Pu	242	1.54E-02
Total		3.51E+01

Reference: Source_H.xls, Worksheet "Quantities", column G (included in Attachment A of this report); respirable release from S-EHA-H-00004, Rev. 1, Appendix B, Calculation 3, Sheet 6.

Classification of release into FDA radionuclide groups

The Pu-238 + Pu-239 + Am-241 group is the only one of the five radionuclide groups that is represented. The only one of the fifteen additional radionuclides evaluated in FDA (1998) that is in this source term is Pu-241. Pu-241 has a DIL of 120 Bq kg⁻¹. DILs for Pu-240 and Pu-242 are not given in FDA (1998) and are not evaluated in this report.

Evaluation of the deposition needed to exceed a DIL

Assume a deposition of 1 Ci m⁻² of the nuclide mix, and that all radionuclides deposit similarly. In this case, the relative concentrations of the deposited material will be the same as that released. The quantities of the individual radionuclides present for this unit deposition are given in Table 2. Attachment A presents applicable spreadsheet calculations.

Table 2. Areal concentrations for a unit deposition

Nuclide	Areal concentration per unit deposition (Ci m ⁻²)
Am241	1.87E-02
Pu238	4.61E-02
Pu239	1.20E-04
Pu240	6.92E-03
Pu241	9.28E-01
Pu242	4.38E-04

Reference: Source_H.xls, Worksheet "Quantities", column I

The concentrations in various foodstuffs due to this unit deposition may now be evaluated. The concentration of a particular radionuclide in a foodstuff is equal to the deposition times the (radionuclide-specific) overall transfer factor. Division of the DIL by the concentration in the foodstuff resulting from a unit deposition gives the deposition needed for a DIL. This process is presented in Tables 3 and 4 for the dairy pathway. Attachment B presents applicable spreadsheet calculations.

Transfer factors for plutonium and americium are derived in WSRC-TR-99-00005, Ingestion Pathway Transfer Factors for Plutonium and Americium. These two elements encompass all radionuclides released in scenario 1-RD-2.35.

Table 3. Radionuclide concentration in milk per unit deposition of particulate mix

Nuclide	Areal concentration per unit deposition (Ci m ⁻²) of mix	Overall transfer factor T _{milk} (m ² L ⁻¹)	Concentration in milk (Ci L ⁻¹) per unit deposition	Radionuclide Group concentration (Ci L ⁻¹)	Radionuclide Group
Am241	1.87E-02	1.21E-05	2.27E-07		
Pu238	4.61E-02	8.90E-06	4.10E-07	6.38E-07	Pu-238 + Pu-239 + Am-241
Pu239	1.20E-04	8.90E-06	1.07E-09		
Pu240	6.92E-03	8.90E-06	6.15E-08	NA	NA
Pu241	9.28E-01	8.90E-06	8.25E-06	8.25E-06	Pu-241
Pu242	4.38E-04	8.90E-06	3.90E-09	NA	NA

Reference: Source_H.xls, Worksheet "Dairy", columns L to O

Table 4. Derived response levels for the milk pathway

Radionuclide Group	Radionuclide Group concentration (Ci L ⁻¹) per unit deposition	DIL (Bq L ⁻¹)	Deposition of mix corresponding to 1 DIL (Ci m ⁻²)
Pu-238 + Pu-239 + Am-241	6.38E-07	2	8.47E-05
Pu-241	8.25E-06	120	3.93E-04

Reference: Source_H.xls, Worksheet "Dairy", columns N to Q

Table 4 presents depositions necessary to equal a DIL for the Pu-238 + Pu-239 + Am-241 group and the individual radionuclide Pu-241. The activity of the depositions includes that from all radionuclides in the mix, even though the radionuclide(s) in a limiting group may only be a small fraction of the total activity released. The most limiting radionuclide group for the milk pathway is the Pu-238 + Pu-239 + Am-241 group.

The processes outlined above may be repeated for other pathways. Table 5 lists total depositions of the radionuclide mix corresponding to 1 DIL (Ci m⁻²) of the Pu-238 + Pu-239 + Am-241 group and the individual radionuclide Pu-241 for all pathways. Attachments B to Q present spreadsheet calculations for each pathway.

Table 5. Derived response levels for all pathways

Pathway	Deposition of mix (Ci m ⁻²) corresponding to 1 DIL of nuclide group	
	Pu-238 + Pu-239 + Am-241	Pu-241
Milk	8.47E-05	3.93E-04
Egg contents	1.67E-05	2.11E-04
Beef	5.96E-06	4.66E-05
Veal	3.49E-07	1.46E-06
Sheep	4.08E-06	2.27E-05
Lamb	1.77E-07	8.12E-07
Pork	2.57E-06	1.43E-05
Poultry	2.46E-06	1.33E-05
Fish	2.78E-08	1.17E-07
Produce-direct deposition	2.91E-09	1.22E-08
Produce - root uptake	6.74E-03	9.39E-02
Produce-soil adhesion	1.63E-04	6.85E-04
Grain-direct deposition	2.91E-09	1.22E-08
Grain-root uptake	2.18E-02	1.32E-01
Grain-soil adhesion	6.78E-05	2.85E-04
Beverage	8.33E-07	3.50E-06

Reference: Source_H.xls, worksheets for each pathway

In all cases, the Pu-238 + Pu-239 + Am-241 group is more limiting than Pu-241, reaching a DIL of the Pu-238 + Pu-239 + Am-241 group at a lower areal deposition than Pu-241. Since DILs are not additive between groups, the following discussion focuses on the Pu-238 + Pu-239 + Am-241 group only.

Table 6 ranks the pathways by the deposition needed to reach a DIL of the Pu-238 + Pu-239 + Am-241 group.

Table 6 Food pathways ranked by DRL

Pathway	Deposition of mix (Ci m^{-2}) corresponding to 1 DIL of Pu-238 + Pu-239 + Am-241 group
Produce-direct deposition	2.91E-09
Grain-direct deposition	2.91E-09
Fish	2.78E-08
Lamb	1.77E-07
Veal	3.49E-07
Beverage	8.33E-07
Poultry	2.46E-06
Pork	2.57E-06
Sheep	4.08E-06
Beef	5.96E-06
Egg contents	1.67E-05
Grain-soil adhesion	6.78E-05
Milk	8.47E-05
Produce-soil adhesion	1.63E-04
Produce - root uptake	6.74E-03
Grain-root uptake	2.18E-02

The direct deposition pathways reach the DIL first (i.e., they have the lowest DRLs). These pathways are important only for crops in the field at the time of passage of the residue cloud. The fish pathway is modeled for fish in stagnant ponds with no absorption of the radionuclides into the sediment. The ranking reflects the bioaccumulation factors for fish that are greater than unity. The meat pathways postulate ingestion of fodder contaminated by directly deposited radionuclides; fodder grown after the deposition and subsequently fed to animals would result in much lower concentrations in animal products.

Determination of range and area of consequences

The HOTSPOT computer code (Homann 1994) was selected to evaluate the consequences of particulate releases (WSRC-TR-98-00392). In the following calculations, a source term equal to the total activity (35.1 Ci) is used, and the range and area affected for different meteorological parameters and DRLs found.

HOTSPOT Parameters used for the H-Area Coil & Tube release are listed in Table 7.

Table 7. HOTSPOT Parameters used for the H-Separations Coil & Tube release (1-RD-2.35)

Parameter	Average Meteorology	95% Adverse Meteorology
Release height	Ground	Ground
Wind speed	2.5 m/s	1.7 m/s
Surface roughness	100 cm	100 cm
Stability class	C	E
Deposition velocity	0.1/1/10 cm/sec	0.1/1/10 cm/sec
Release duration	120 min	120 min
Inversion layer	500 m	200 m

Meteorological data is consistent with Revision 1 of S-EHA-H-00004, Interim Emergency Preparedness Hazards Assessment for H Area Separations, Appendix B, Calculation 5, Sheet 1, which references Consequence Assessment for Emergency Preparedness Hazards Assessments. TP-95-002, Revision 3, January 21, 1997.

Results

Tables 8 and 9 summarize ingestion pathway consequences for average meteorology. If a contour (DRL) is not exceeded and/or the area affected is insignificant, "N/E" is entered for the value. Attachments R through T present the plots produced by the HOTSPOT runs for average meteorology.

Table 8. Ranges until deposition less than DRL, average meteorology, H-Separations, 1-RD-2.35

Pathway	DRL Ci m ⁻²	0.1 cm s ⁻¹ km	1 cm s ⁻¹ km	10 cm s ⁻¹ km
Produce-direct deposition	2.91E-09	40	>100	>100
Grain-direct deposition	2.91E-09	40	>100	>100
Fish	2.78E-08	1.5	40	>100
Lamb	1.77E-07	0.6	2.0	15
Veal	3.49E-07	0.45	1.5	6.0
Beverage	8.33E-07	0.3	0.9	2.0
Poultry	2.46E-06	0.15	0.5	1.2
Pork	2.57E-06	0.15	0.5	1.2
Sheep	4.08E-06	0.10	0.4	0.9
Beef	5.96E-06	0.10	0.3	0.75
Egg contents	1.67E-05	0.06	0.2	0.5
Grain-soil adhesion	6.78E-05	0.03	0.1	0.25
Milk	8.47E-05	0.03	0.08	0.2
Produce-soil adhesion	1.63E-04	0.02	0.06	0.15
Produce - root uptake	6.74E-03	N/E	0.01	0.03
Grain-root uptake	2.18E-02	N/E	N/E	0.015

Table 9. Areas above DRL, average meteorology, H-Separations, 1-RD-2.35

Pathway	DRL Ci m ⁻²	0.1 cm s ⁻¹ km ²	1 cm s ⁻¹ km ²	10 cm s ⁻¹ km ²
Produce-direct deposition	2.91E-09	1.0E+02	>1.3E+03	>1.6E+03
Grain-direct deposition	2.91E-09	1.0E+02	>1.3E+03	>1.6E+03
Fish	2.78E-08	5.8E-01	8.6E+01	>8.7E+02
Lamb	1.77E-07	9.9E-02	8.0E-01	2.0E+01
Veal	3.49E-07	5.0E-02	4.8E-01	4.7E+00
Beverage	8.33E-07	2.1E-02	2.0E-01	9.8E-01
Poultry	2.46E-06	6.7E-03	6.7E-02	3.5E-01
Pork	2.57E-06	6.4E-03	6.4E-02	3.4E-01
Sheep	4.08E-06	4.1E-03	4.0E-02	2.2E-01
Beef	5.96E-06	2.6E-03	2.8E-02	1.5E-01
Egg contents	1.67E-05	N/E	9.9E-03	5.8E-02
Grain-soil adhesion	6.78E-05	N/E	N/E	1.5E-02
Milk	8.47E-05	N/E	N/E	1.3E-02
Produce-soil adhesion	1.63E-04	N/E	N/E	6.7E-03
Produce - root uptake	6.74E-03	N/E	N/E	N/E
Grain-root uptake	2.18E-02	N/E	N/E	N/E

Tables 10 and 11 summarize ingestion pathway consequences for adverse meteorology. Plots from the HOTSPOT runs are included in Attachments U through W.

Table 10. Ranges until deposition less than DRL, 95% adverse meteorology, H-Separations, 1-RD-2.35

Pathway	DRL Ci m^{-2}	0.1 cm s^{-1} km	1 cm s^{-1} km	10 cm s^{-1} km
Produce-direct deposition	2.91E-09	>100	>100	>100
Grain-direct deposition	2.91E-09	>100	>100	>100
Fish	2.78E-08	25	>100	32
Lamb	1.77E-07	3	30	7
Veal	3.49E-07	1.8	11	4
Beverage	8.33E-07	1.0	4	2.5
Poultry	2.46E-06	0.5	2	1.5
Pork	2.57E-06	0.5	2	1.5
Sheep	4.08E-06	0.4	1.4	1.1
Beef	5.96E-06	0.3	1.0	0.9
Egg contents	1.67E-05	0.2	0.6	0.6
Grain-soil adhesion	6.78E-05	0.09	0.3	0.3
Milk	8.47E-05	0.08	0.2	0.28
Produce-soil adhesion	1.63E-04	0.06	0.16	0.25
Produce - root uptake	6.74E-03	N/E	0.025	0.05
Grain-root uptake	2.18E-02	N/E	0.015	0.035

Table 11. Areas above DRL, 95% adverse meteorology, H-Separations, 1-RD-2.35

Pathway	DRL Ci m^{-2}	0.1 cm s^{-1} km^2	1 cm s^{-1} km^2	10 cm s^{-1} km^2
Produce-direct deposition	2.91E-09	>6.0E+02	>8.6E+02	>5.7E+02
Grain-direct deposition	2.91E-09	>6.0E+02	>8.6E+02	>5.7E+02
Fish	2.78E-08	2.2E+01	>5.3E+02	3.9E+01
Lamb	1.77E-07	7.3E-01	2.6E+01	3.3E+00
Veal	3.49E-07	3.2E-01	5.1E+00	1.8E+00
Beverage	8.33E-07	1.1E-01	1.4E+00	7.5E-01
Poultry	2.46E-06	3.2E-02	3.5E-01	2.7E-01
Pork	2.57E-06	3.1E-02	3.4E-01	2.6E-01
Sheep	4.08E-06	1.9E-02	2.0E-01	1.7E-01
Beef	5.96E-06	1.2E-02	1.3E-01	1.3E-01
Egg contents	1.67E-05	4.1E-03	4.0E-02	5.2E-02
Grain-soil adhesion	6.78E-05	N/E	8.9E-03	1.6E-02
Milk	8.47E-05	N/E	7.1E-03	1.4E-02
Produce-soil adhesion	1.63E-04	N/E	3.7E-03	8.0E-03
Produce - root uptake	6.74E-03	N/E	N/E	N/E
Grain-root uptake	2.18E-02	N/E	N/E	N/E

Conclusion

Tables 8 to 11 present ingestion pathway consequences from H-Separations accident scenario 1-RD-2.35, Coil and Tube Failure. The Pu-238 + Pu-239 + Am-241 group is the most limiting for all pathways. The most significant pathways are those involving ingestion of freshly deposited radionuclides on produce and grain. Contamination of produce and grain exceeds FDA guidelines out to at least 40 km in all cases, and out to greater than 100 km in most cases. Additionally, under some conditions, it may be possible for fish and lamb foodstuffs to exceed FDA guidelines offsite. Sampling and analysis of these pathways would be recommended. Ranges for all other pathways are less than the distance to the site boundary (approximately 11 km), so protective actions for these other pathways would not be recommended for offsite locations.

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Attachments

Attachment A

Source term and areal concentrations spreadsheet calculations

Attachment B

Contamination of dairy products spreadsheet calculations

Attachment C

Contamination of egg contents spreadsheet calculations

Attachment D

Contamination of beef spreadsheet calculations

Attachment E

Contamination of veal spreadsheet calculations

Attachment F

Contamination of sheep spreadsheet calculations

Attachment G

Contamination of lamb spreadsheet calculations

Attachment H

Contamination of pork spreadsheet calculations

Attachment I

Contamination of poultry spreadsheet calculations

Attachment J

Contamination of fish spreadsheet calculations

Attachment K

External contamination of produce from direct deposition spreadsheet calculations

Attachment L

Internal contamination of produce from root uptake spreadsheet calculations

Attachment M

External contamination of leafy vegetables during harvest spreadsheet calculations

Attachment N

External contamination of grain spreadsheet calculations

Attachment O

Internal contamination of grain by root uptake spreadsheet calculations

Attachment P

External contamination of grain during harvest spreadsheet calculations

Attachment Q

Contamination of beverages spreadsheet calculations

Attachment R

HOTSPOT results - average meteorology, 0.1 cm s^{-1}

Attachment S

HOTSPOT results - average meteorology, 1.0 cm s^{-1}

Attachment T

HOTSPOT results - average meteorology, 10 cm s^{-1}

Attachment U

HOTSPOT results - adverse meteorology, 0.1 cm s^{-1}

Attachment V

HOTSPOT results - adverse meteorology, 1.0 cm s^{-1}

Attachment W

HOTSPOT results - adverse meteorology, 10 cm s^{-1}

Attachment A

Source term and areal concentrations spreadsheet calculations

	A	B	G	I	J
6	respirable (Ci) = total			Unit	
7	H			Release	
8	Element	At. No.		Fraction	
9				Ci/m2	
10	Am	241	6.57E-01	1.87E-02	
11	Am	243	0		
12	Ba	133	0		
13	Ce	144	0		
14	Cf	249	0		
15	Cf	252	0		
16	Cm	244	0		
17	Cm	246	0		
18	Co	60	0		
19	Cs	137	0		
20	H	3	0		
21	Np	237	0		
22	Pm	147	0		
23	Pu	238	1.62E+00	4.61E-02	
24	Pu	239	4.23E-03	1.20E-04	
25	Pu mix	239/241	0		
26	Pu	240	2.43E-01	6.92E-03	
27	Pu	241	3.26E+01	9.28E-01	
28	Pu	242	1.54E-02	4.38E-04	
29	Sr	90	0		
30	Tc	99	0		
31	Th	232	0		
32	Tl	204	0		
33	U	235	0		
34	U	238	0		
35					
36	Sum		3.51E+01	1.00E+00	checks

	A	B	G	I	J
			respirable (Ci) = total H	Unit Release Fraction Ci/m ²	
6	7	8	9	10	11
Element	At. No.				
Am	241		0.657	=G10/\$G\$36	
Am	243		0		
Ba	133		0		
Ce	144		0		
Cf	249		0		
Cf	252		0		
Cf	244		0		
Cm	246		0		
Cm	60		0		
Co	137		0		
Cs	3		0		
H	237		0		
Np	147		0		
Pm	238		1.62		
Pu	239		0.00423		
Pu	239/241		0		
Pu mix					
Pu	240		0.243	=G23/\$G\$36	
Pu	241		32.6	=G24/\$G\$36	
Pu	242		0.0154	=G26/\$G\$36	
Pu	90		0	=G27/\$G\$36	
Sr	99		0	=G28/\$G\$36	
Tc	232		0		
Th	204		0		
Ti	235		0		
U	238		0		
U					
Sum			=G10+G23+G24+G26+G27+G28	=I10+I23+I24+I26+I27+I28	checks

Attachment B

Contamination of dairy products spreadsheet calculations

	A	B	L	M	N	O	P	Q
2	Dairy							
3	Consumption of direct deposition on pasture					Group	Group DIL	Total
4						sum		Dep for
5			DEP				Bq/L	DIL
6		Tmilk	Unit	T x DEP				Ci/m2
7			Release	Ci/L	Ci/L			
8	Element	At. No.	m2/L	Fraction				
9				Ci/m2				
10	Am	241	1.21E-05	1.87E-02	2.27E-07			
11	Am	243	1.21E-05					
12	Ba	133	3.88E-03					
13	Ce	144	2.43E-04					
14	Cf	249	1.62E-05					
15	Cf	252	1.62E-05		Am241			
16	Cm	244	1.62E-05		Pu238	6.38E-07	2	8.47E-05
17	Cm	246	1.62E-05		Pu239			
18	Co	60	2.43E-03					
19	Cs	137	6.39E-02					
20	H	3	1.21E-01					
21	Np	237	4.04E-05					
22	Pm	147	4.85E-04					
23	Pu	238	8.90E-06	4.61E-02	4.10E-07			
24	Pu	239	8.90E-06	1.20E-04	1.07E-09			
25	Pu	39/241	8.90E-06					
26	Pu	240	8.90E-06	6.92E-03	6.15E-08			
27	Pu	241	8.90E-06	9.28E-01	8.25E-06	8.25E-06	120	3.93E-04
28	Pu	242	8.90E-06	4.38E-04	3.90E-09			
29	Sr	90	2.26E-02					
30	Tc	99	1.86E-04					
31	Th	232	4.04E-05					
32	Tl	204	2.43E-02					
33	U	235	3.24E-03					
34	U	238	3.24E-03					

	A	B	L	M	N	O	P	Q
2	Dairy							
3	Consumption of direct					Group sum	Group DIL	Total Dep for DIL
4								Dep for DIL
5				DEP Unit Release	T x DEP Ci/L		Bq/L	Ci/m2
6			Tmilk					
7						Ci/L		
8	Element	At. No.	m2/L	Fraction Ci/m2				
9								
10	Am	241	=D10*F10*J10/H10	=Quantities!\$I10	=L10*M10			
11	Am	243	=D11*F11*J11/H11					
12	Ba	133	=D12*F12*J12/H12					
13	Ce	144	=D13*F13*J13/H13					
14	Cf	249	=D14*F14*J14/H14					
15	Cf	252	=D15*F15*J15/H15		Am241			
16	Cm	244	=D16*F16*J16/H16		Pu238	=N10+N23+N24	2	=P16/O16/37000000000
17	Cm	246	=D17*F17*J17/H17		Pu239			
18	Co	60	=D18*F18*J18/H18					
19	Cs	137	=D19*F19*J19/H19					
20	H	3	=D20*F20*J20/H20					
21	Np	237	=D21*F21*J21/H21					
22	Pm	147	=D22*F22*J22/H22					
23	Pu	238	=D23*F23*J23/H23	=Quantities!\$I23	=L23*M23			
24	Pu	239	=D24*F24*J24/H24	=Quantities!\$I24	=L24*M24			
25	Pu	239/241	=D25*F25*J25/H25					
26	Pu	240	=D26*F26*J26/H26	=Quantities!\$I26	=L26*M26			
27	Pu	241	=D27*F27*J27/H27	=Quantities!\$I27	=L27*M27	=N27	120	=P27/O27/37000000000
28	Pu	242	=D28*F28*J28/H28	=Quantities!\$I28	=L28*M28			
29	Sr	90	=D29*F29*J29/H29					
30	Tc	99	=D30*F30*J30/H30					
31	Th	232	=D31*F31*J31/H31					
32	Ti	204	=D32*F32*J32/H32					
33	U	235	=D33*F33*J33/H33					
34	U	238	=D34*F34*J34/H34					

Attachment C

Contamination of egg contents spreadsheet calculations

	A	B	L	M	N	O	P	Q
2	Egg contents							
3						Group	Group DIL	Total
4						sum		Dep for
5							Ci/kg	DIL
6			Teggs	Unit	T x DEP			Ci/m2
7				Release	Ci/kg	Ci/kg		
8	Element	At. No.	m2/kg	Fraction				
9				Ci/m2				
10	Am	241	1.33E-04	1.87E-02	2.48E-06			
11	Am	243	1.33E-04					
12	Ba	133	2.98E-02					
13	Ce	144	2.98E-06					
14	Cf	249						
15	Cf	252			Am241			
16	Cm	244			Pu238	3.24E-06	2	1.67E-05
17	Cm	246			Pu239			
18	Co	60	3.31E-03					
19	Cs	137	1.33E-02					
20	H	3						
21	Np	237						
22	Pm	147	6.63E-04					
23	Pu	238	1.66E-05	4.61E-02	7.64E-07			
24	Pu	239	1.66E-05	1.20E-04	1.99E-09			
25	Pu	39/241	1.66E-05					
26	Pu	240	1.66E-05	6.92E-03	1.15E-07			
27	Pu	241	1.66E-05	9.28E-01	1.54E-05	1.54E-05	120	2.11E-04
28	Pu	242	1.66E-05	4.38E-04	7.26E-09			
29	Sr	90	6.63E-03					
30	Tc	99	9.94E-02					
31	Th	232						
32	Tl	204						
33	U	235	3.31E-02					
34	U	238	3.31E-02					

	A	B	L	M	N	O	P	Q
2	Egg contents							
3						Group	Group DIL	Total
4						sum		Dep for
5							Ci/kg	DIL
6			Teggs	Unit	T x DEP			Ci/m2
7				Release	Ci/kg	Ci/kg		
8	Element	At. No.	m2/kg	Fraction				
9				Ci/m2				
10	Am	241	=D10*F10*J10/H10	=Quantities!\$I10	=L10*M10			
11	Am	243	=D11*F11*J11/H11					
12	Ba	133	=D12*F12*J12/H12					
13	Ce	144	=D13*F13*J13/H13					
14	Cf	249						
15	Cf	252			Am241			
16	Cm	244			Pu238	=N10+N23+N24	2	=P16/O16/37000000000
17	Cm	246			Pu239			
18	Co	60	=D18*F18*J18/H18					
19	Cs	137	=D19*F19*J19/H19					
20	H	3						
21	Np	237						
22	Pm	147	=D22*F22*J22/H22					
23	Pu	238	=D23*F23*J23/H23	=Quantities!\$I23	=L23*M23			
24	Pu	239	=D24*F24*J24/H24	=Quantities!\$I24	=L24*M24			
25	Pu	239/241	=D25*F25*J25/H25					
26	Pu	240	=D26*F26*J26/H26	=Quantities!\$I26	=L26*M26			
27	Pu	241	=D27*F27*J27/H27	=Quantities!\$I27	=L27*M27	=N27	120	=P27/O27/37000000000
28	Pu	242	=D28*F28*J28/H28	=Quantities!\$I28	=L28*M28			
29	Sr	90	=D29*F29*J29/H29					
30	Tc	99	=D30*F30*J30/H30					
31	Th	232						
32	Tl	204						
33	U	235	=D33*F33*J33/H33					
34	U	238	=D34*F34*J34/H34					

Attachment D

Contamination of beef spreadsheet calculations

	A	B	L	M	N	O	P	Q
2	Beef							
3						Group	Group	Total
4						sum	DIL	Dep for
5							Bq/kg	DIL
6		Tbeef	Unit	T x DEP				CI/m2
7			Release	CI/kg	CI/kg			
8	Element	At. No.	m2/kg	Fraction				
9				CI/m2				
10	Am	241	3.00E-04	1.87E-02	5.61E-06			
11	Am	243	3.00E-04					
12	Ba	133	1.50E-03					
13	Ce	144	1.50E-04					
14	Cf	249	4.50E-04					
15	Cf	252	4.50E-04		Am241			
16	Cm	244	1.50E-04		Pu238	9.08E-06	2	5.96E-06
17	Cm	246	1.50E-04		Pu239			
18	Co	60	7.50E-04					
19	Cs	137	3.75E-01					
20	H	3						
21	Np	237	7.50E-03					
22	Pm	147	1.50E-02					
23	Pu	238	7.50E-05	4.61E-02	3.46E-06			
24	Pu	239	7.50E-05	1.20E-04	9.03E-09			
25	Pu	239/241	7.50E-05					
26	Pu	240	7.50E-05	6.92E-03	5.19E-07			
27	Pu	241	7.50E-05	9.28E-01	6.96E-05	6.96E-05	120	4.66E-05
28	Pu	242	7.50E-05	4.38E-04	3.29E-08			
29	Sr	90	6.00E-02					
30	Tc	99	7.50E-06					
31	Th	232	7.50E-04					
32	Tl	204	1.50E-01					
33	U	235	2.25E-03					
34	U	238	2.25E-03					

[illegible]

Attachment E

Contamination of veal spreadsheet calculations

	A	B	L	M	N	O	P	Q
2	Veal							
3						Group	Group	
4						sum	DIL	Total
5							Bq/kg	Dep for
6			Tveal	Unit	T x DEP			DIL
7				Release	Ci/kg	Ci/kg		Ci/m2
8	Element	At. No.	m2/kg	Fraction				
9				Ci/m2				
10	Am	241	2.39E-03	1.87E-02	4.47E-05			
11	Am	243	2.39E-03					
12	Ba	133						
13	Ce	144						
14	Cf	249						
15	Cf	252			Am241			
16	Cm	244			Pu238	1.55E-04	2	3.49E-07
17	Cm	246			Pu239			
18	Co	60						
19	Cs	137	4.78E-01					
20	H	3						
21	Np	237						
22	Pm	147						
23	Pu	238	2.39E-03	4.61E-02	1.10E-04			
24	Pu	239	2.39E-03	1.20E-04	2.88E-07			
25	Pu	39/241	2.39E-03					
26	Pu	240	2.39E-03	6.92E-03	1.65E-05			
27	Pu	241	2.39E-03	9.28E-01	2.22E-03	2.22E-03	120	1.46E-06
28	Pu	242	2.39E-03	4.38E-04	1.05E-06			
29	Sr	90	2.39E-01					
30	Tc	99						
31	Th	232						
32	Tl	204						
33	U	235						
34	U	238						

	A	B	L	M	N	O	P	Q
2	Veal							
3						Group	Group DIL	Total
4						sum		Dep for
5							Bq/kg	DIL
6			Tveal	Unit	T x DEP			Ci/m2
7				Release	Ci/kg	Ci/kg		
8	Element	At. No.	m2/kg	Fraction				
9				Ci/m2				
10	Am	241	=D10*F10*J10/H10	=Quantities!\$I10	=L10*M10			
11	Am	243	=D11*F11*J11/H11					
12	Ba	133						
13	Ce	144						
14	Cf	249						
15	Cf	252			Am241			
16	Cm	244			Pu238	=N10+N23+N24	2	=P16/O16/370000000000
17	Cm	246			Pu239			
18	Co	60						
19	Cs	137	=D19*F19*J19/H19					
20	H	3						
21	Np	237						
22	Pm	147						
23	Pu	238	=D23*F23*J23/H23	=Quantities!\$I23	=L23*M23			
24	Pu	239	=D24*F24*J24/H24	=Quantities!\$I24	=L24*M24			
25	Pu	239/241	=D25*F25*J25/H25					
26	Pu	240	=D26*F26*J26/H26	=Quantities!\$I26	=L26*M26			
27	Pu	241	=D27*F27*J27/H27	=Quantities!\$I27	=L27*M27	=N27	120	=P27/O27/370000000000
28	Pu	242	=D28*F28*J28/H28	=Quantities!\$I28	=L28*M28			
29	Sr	90	=D29*F29*J29/H29					
30	Tc	99						
31	Th	232						
32	Ti	204						
33	U	235						
34	U	238						

Attachment F

Contamination of sheep spreadsheet calculations

	A	B	L	M	N	O	P	Q
2	Sheep							
3						Group	Group DIL	Total
4						sum		Dep for
5							Bq/kg	DIL
6			Tsheep	Unit	T x DEP			Ci/m2
7				Release	Ci/kg	Ci/kg		
8	Element	At. No.	m2/kg	Fraction				
9				Ci/m2				
10	Am	241	3.28E-04	1.87E-02	6.13E-06			
11	Am	243	3.28E-04					
12	Ba	133						
13	Ce	144	3.28E-04					
14	Cf	249						
15	Cf	252			Am241			
16	Cm	244			Pu238	1.32E-05	2	4.08E-06
17	Cm	246			Pu239			
18	Co	60	1.02E-01					
19	Cs	137	2.79E-01					
20	H	3						
21	Np	237						
22	Pm	147						
23	Pu	238	1.54E-04	4.61E-02	7.10E-06			
24	Pu	239	1.54E-04	1.20E-04	1.85E-08			
25	Pu	39/241	1.54E-04					
26	Pu	240	1.54E-04	6.92E-03	1.07E-06			
27	Pu	241	1.54E-04	9.28E-01	1.43E-04	1.43E-04	120	2.27E-05
28	Pu	242	1.54E-04	4.38E-04	6.75E-08			
29	Sr	90	6.56E-02					
30	Tc	99						
31	Th	232						
32	Tl	204						
33	U	235						
34	U	238						

	A	B	L	M	N	O	P	Q
2	Sheep							
3						Group	Group DIL	Total
4						sum		Dep for
5							Bq/kg	DIL
6			Tsheep	Unit	T x DEP			Ci/m2
7				Release	Ci/kg	Ci/kg		
8	Element	At. No.	m2/kg	Fraction				
9				Ci/m2				
10	Am	241	=D10*F10*J10/H10	=Quantities!\$I10	=L10*M10			
11	Am	243	=D11*F11*J11/H11					
12	Ba	133						
13	Ce	144	=D13*F13*J13/H13					
14	Cf	249						
15	Cf	252			Am241			
16	Cm	244			Pu238	=N10+N23+N24	2	=P16/O16/37000000000
17	Cm	246			Pu239			
18	Co	60	=D18*F18*J18/H18					
19	Cs	137	=D19*F19*J19/H19					
20	H	3						
21	Np	237						
22	Pm	147						
23	Pu	238	=D23*F23*J23/H23	=Quantities!\$I23	=L23*M23			
24	Pu	239	=D24*F24*J24/H24	=Quantities!\$I24	=L24*M24			
25	Pu	239/241	=D25*F25*J25/H25					
26	Pu	240	=D26*F26*J26/H26	=Quantities!\$I26	=L26*M26			
27	Pu	241	=D27*F27*J27/H27	=Quantities!\$I27	=L27*M27	=N27	120	=P27/O27/37000000000
28	Pu	242	=D28*F28*J28/H28	=Quantities!\$I28	=L28*M28			
29	Sr	90	=D29*F29*J29/H29					
30	Tc	99						
31	Th	232						
32	Tl	204						
33	U	235						
34	U	238						

Attachment G

Contamination of lamb spreadsheet calculations

	A	B	L	M	N	O	P	Q
2	Lamb							
3						Group	Group DIL	Total
4						sum		Dep for
5							Bq/kg	DIL
6			TIamb	Unit	T x DEP			Ci/m2
7				Release	Ci/kg	Ci/kg		
8	Element	At. No.	m2/kg	Fraction				
9				Ci/m2				
10	Am	241	5.69E-03	1.87E-02	1.06E-04			
11	Am	243	5.69E-03					
12	Ba	133						
13	Ce	144						
14	Cf	249						
15	Cf	252			Am241			
16	Cm	244			Pu238	3.05E-04	2	1.77E-07
17	Cm	246			Pu239			
18	Co	60						
19	Cs	137	6.81E-01					
20	H	3						
21	Np	237						
22	Pm	147						
23	Pu	238	4.31E-03	4.61E-02	1.98E-04			
24	Pu	239	4.31E-03	1.20E-04	5.18E-07			
25	Pu	39/241	4.31E-03					
26	Pu	240	4.31E-03	6.92E-03	2.98E-05			
27	Pu	241	4.31E-03	9.28E-01	3.99E-03	3.99E-03	120	8.12E-07
28	Pu	242	4.31E-03	4.38E-04	1.89E-06			
29	Sr	90	4.58E-01					
30	Tc	99						
31	Th	232						
32	Ti	204						
33	U	235						
34	U	238						

	A	B	L	M	N	O	P	Q
2	Lamb							
3						Group	Group DIL	Total
4						sum		Dep for
5							Bq/kg	DIL
6			Tlamb	Unit	T x DEP			Ci/m2
7				Release	Ci/kg	Ci/kg		
8	Element	At. No.	m2/kg	Fraction				
9				Ci/m2				
10	Am	241	=D10*F10*J10/H10	=Quantities!\$I10	=L10*M10			
11	Am	243	=D11*F11*J11/H11					
12	Ba	133						
13	Ce	144						
14	Cf	249						
15	Cf	252			Am241			
16	Cm	244			Pu238	=N10+N23+N24	2	=P16/O16/37000000000
17	Cm	246			Pu239			
18	Co	60						
19	Cs	137	=D19*F19*J19/H19					
20	H	3						
21	Np	237						
22	Pm	147						
23	Pu	238	=D23*F23*J23/H23	=Quantities!\$I23	=L23*M23			
24	Pu	239	=D24*F24*J24/H24	=Quantities!\$I24	=L24*M24			
25	Pu	239/241	=D25*F25*J25/H25					
26	Pu	240	=D26*F26*J26/H26	=Quantities!\$I26	=L26*M26			
27	Pu	241	=D27*F27*J27/H27	=Quantities!\$I27	=L27*M27	=N27	120	=P27/O27/37000000000
28	Pu	242	=D28*F28*J28/H28	=Quantities!\$I28	=L28*M28			
29	Sr	90	=D29*F29*J29/H29					
30	Tc	99						
31	Th	232						
32	Ti	204						
33	U	235						
34	U	238						

Attachment H

Contamination of pork spreadsheet calculations

	A	B	L	M	N	O	P	Q
2	Pork							
3						Group	Group DIL	Total
4						sum		Dep for
5							Bq/kg	DIL
6		Tpork	Unit	T x DEP				Ci/m2
7			Release	Ci/kg	Ci/kg			
8	Element	At. No.	m2/kg	Fraction				
9				Ci/m2				
10	Am	241	5.19E-04	1.87E-02	9.71E-06			
11	Am	243	5.19E-04					
12	Ba	133	0.00E+00					
13	Ce	144	3.06E-04					
14	Cf	249						
15	Cf	252			Am241			
16	Cm	244			Pu238	2.10E-05	2	2.57E-06
17	Cm	246			Pu239			
18	Co	60						
19	Cs	137	7.33E-01					
20	H	3						
21	Np	237						
22	Pm	147						
23	Pu	238	2.44E-04	4.61E-02	1.13E-05			
24	Pu	239	2.44E-04	1.20E-04	2.94E-08			
25	Pu	39/241	2.44E-04					
26	Pu	240	2.44E-04	6.92E-03	1.69E-06			
27	Pu	241	2.44E-04	9.28E-01	2.27E-04	2.27E-04	120	1.43E-05
28	Pu	242	2.44E-04	4.38E-04	1.07E-07			
29	Sr	90	1.22E-01					
30	Tc	99	4.58E-04					
31	Th	232						
32	Ti	204						
33	U	235	1.89E-01					
34	U	238	1.89E-01					

	A	B	L	M	N	O	P	Q
2	Pork							
3						Group	Group DIL	Total
4						sum		Dep for
5							Bq/kg	DIL
6			Tpork	Unit	T x DEP			Ci/m2
7				Release	Ci/kg	Ci/kg		
8	Element	At. No.	m2/kg	Fraction				
9				Ci/m2				
10	Am	241	=D10*F10*J10/H10	=Quantities!\$I10	=L10*M10			
11	Am	243	=D11*F11*J11/H11					
12	Ba	133	=D12*F12*J12/H12					
13	Ce	144	=D13*F13*J13/H13					
14	Cf	249						
15	Cf	252			Am241			
16	Cm	244			Pu238	=N10+N23+N24	2	=P16/O16/370000000000
17	Cm	246			Pu239			
18	Co	60						
19	Cs	137	=D19*F19*J19/H19					
20	H	3						
21	Np	237						
22	Pm	147						
23	Pu	238	=D23*F23*J23/H23	=Quantities!\$I23	=L23*M23			
24	Pu	239	=D24*F24*J24/H24	=Quantities!\$I24	=L24*M24			
25	Pu	239/241	=D25*F25*J25/H25					
26	Pu	240	=D26*F26*J26/H26	=Quantities!\$I26	=L26*M26			
27	Pu	241	=D27*F27*J27/H27	=Quantities!\$I27	=L27*M27	=N27	120	=P27/O27/370000000000
28	Pu	242	=D28*F28*J28/H28	=Quantities!\$I28	=L28*M28			
29	Sr	90	=D29*F29*J29/H29					
30	Tc	99	=D30*F30*J30/H30					
31	Th	232						
32	Ti	204						
33	U	235	=D33*F33*J33/H33					
34	U	238	=D34*F34*J34/H34					

Attachment I

Contamination of poultry spreadsheet calculations

	A	B	L	M	N	O	P	Q
2	Poultry							
3						Group	Group DIL	Total
4						sum		Dep for
5							Bq/kg	DIL
6		Tpoultry	Unit	T x DEP				Ci/m2
7			Release	Ci/kg	Ci/kg			
8	Element	At. No.	m2/kg	Fraction				
9				Ci/m2				
10	Am	241	5.25E-04	1.87E-02	9.82E-06			
11	Am	243	5.25E-04					
12	Ba	133	7.88E-04					
13	Ce	144	3.50E-04					
14	Cf	249						
15	Cf	252			Am241			
16	Cm	244			Pu238	2.19E-05	2	2.46E-06
17	Cm	246			Pu239			
18	Co	60	1.75E-01					
19	Cs	137	8.75E-01					
20	H	3						
21	Np	237						
22	Pm	147	1.75E-04					
23	Pu	238	2.63E-04	4.61E-02	1.21E-05			
24	Pu	239	2.63E-04	1.20E-04	3.16E-08			
25	Pu	239/241	2.63E-04					
26	Pu	240	2.63E-04	6.92E-03	1.82E-06			
27	Pu	241	2.63E-04	9.28E-01	2.44E-04	2.44E-04	120	1.33E-05
28	Pu	242	2.63E-04	4.38E-04	1.15E-07			
29	Sr	90	7.00E-03					
30	Tc	99	2.63E-03					
31	Th	232						
32	Ti	204						
33	U	235	8.75E-02					
34	U	238	8.75E-02					

	A	B	L	M	N	O	P	Q
2	Poultry							
3						Group	Group DIL	Total
4						sum		Dep for
5							Bq/kg	DIL
6			Tpoultry	Unit	T x DEP			Ci/m2
7				Release	Ci/kg	Ci/kg		
8	Element	At. No.	m2/kg	Fraction				
9				Ci/m2				
10	Am	241	=D10*F10*J10/H10	=Quantities!\$I10	=L10*M10			
11	Am	243	=D11*F11*J11/H11					
12	Ba	133	=D12*F12*J12/H12					
13	Ce	144	=D13*F13*J13/H13					
14	Cf	249						
15	Cf	252			Am241			
16	Cm	244			Pu238	=N10+N23+N24	2	=P16/O16/37000000000
17	Cm	246			Pu239			
18	Co	60	=D18*F18*J18/H18					
19	Cs	137	=D19*F19*J19/H19					
20	H	3						
21	Np	237						
22	Pm	147	=D22*F22*J22/H22					
23	Pu	238	=D23*F23*J23/H23	=Quantities!\$I23	=L23*M23			
24	Pu	239	=D24*F24*J24/H24	=Quantities!\$I24	=L24*M24			
25	Pu	239/241	=D25*F25*J25/H25					
26	Pu	240	=D26*F26*J26/H26	=Quantities!\$I26	=L26*M26			
27	Pu	241	=D27*F27*J27/H27	=Quantities!\$I27	=L27*M27	=N27	120	=P27/O27/37000000000
28	Pu	242	=D28*F28*J28/H28	=Quantities!\$I28	=L28*M28			
29	Sr	90	=D29*F29*J29/H29					
30	Tc	99	=D30*F30*J30/H30					
31	Th	232						
32	Tl	204						
33	U	235	=D33*F33*J33/H33					
34	U	238	=D34*F34*J34/H34					

Attachment J

Contamination of fish spreadsheet calculations

	B	C	I	J	K	L	M	N
2	Fish							
3						Group	Group DIL	Total
4						sum		Dep for
5							Bq/kg	DIL
6		T	Unit	T x DEP				Ci/m2
7		fish	Release	Ci/kg	Ci/kg			
8	Element	At. No.	m2/kg	Fraction				
9				Ci/m2				
10	Am	241	0.03	1.87E-02	5.61E-04			
11	Am	243	0.03					
12	Ba	133	0.004					
13	Ce	144	0.03					
14	Cf	249	0.025					
15	Cf	252	0.025		Am241			
16	Cm	244	0.03		Pu238	1.95E-03	2	2.78E-08
17	Cm	246	0.03		Pu239			
18	Co	60	0.3					
19	Cs	137	2					
20	H	3	0.001					
21	Np	237	0.03					
22	Pm	147	0.03					
23	Pu	238	0.03	4.61E-02	1.38E-03			
24	Pu	239	0.03	1.20E-04	3.61E-06			
25	Pu	39/241	0.03					
26	Pu	240	0.03	6.92E-03	2.07E-04			
27	Pu	241	0.03	9.28E-01	2.78E-02	2.78E-02	120	1.17E-07
28	Pu	242	0.03	4.38E-04	1.31E-05			
29	Sr	90	0.06					
30	Tc	99	0.02					
31	Th	232	0.1					
32	Tl	204	10					
33	U	235	0.01					
34	U	238	0.01					

[illegible]

Attachment K

External contamination of produce from direct deposition spreadsheet calculations

	A	B	H	I	J	K	L	M
2	Produce-direct deposition							
3						Group	Group DIL	Total
4						sum		Dep for
5			m2/kg				Bq/kg	DIL
6				Unit	T x DEP			Ci/m2
7				Release	Ci/kg	Ci/kg		
8	Element	At. No.	T	Fraction				
9				Ci/m2				
10	Am	241	0.285714	1.87E-02	5.34E-03			
11	Am	243	0.285714					
12	Ba	133	0.285714					
13	Ce	144	0.285714					
14	Cf	249	0.285714					
15	Cf	252	0.285714		Am241			
16	Cm	244	0.285714		Pu238	1.85E-02	2	2.91E-09
17	Cm	246	0.285714		Pu239			
18	Co	60	0.285714					
19	Cs	137	0.285714					
20	H	3	0.285714					
21	Np	237	0.285714					
22	Pm	147	0.285714					
23	Pu	238	0.285714	4.61E-02	1.32E-02			
24	Pu	239	0.285714	1.20E-04	3.44E-05			
25	Pu	239/241	0.285714					
26	Pu	240	0.285714	6.92E-03	1.98E-03			
27	Pu	241	0.285714	9.28E-01	2.65E-01	2.65E-01	120	1.22E-08
28	Pu	242	0.285714	4.38E-04	1.25E-04			
29	Sr	90	0.285714					
30	Tc	99	0.285714					
31	Th	232	0.285714					
32	Tl	204	0.285714					
33	U	235	0.285714					
34	U	238	0.285714					

Produce-direct

Attachment L

Internal contamination of produce from root uptake spreadsheet calculations

	A	B	H	I	J	K	L	M
2	Produce-root uptake							
3						Group	Group	Total
4						sum		Dep for
5							Bq/kg	DIL
6		m2/kg	Unit	T x DEP				Ci/m2
7			Release	Ci/kg	Ci/kg			
8	Element	At. No. T=B/280	Fraction					
9			Ci/m2					
10	Am	241	3.37E-07	1.87E-02	6.30E-09			
11	Am	243	3.37E-07					
12	Ba	133	1.53E-05					
13	Ce	144	1.53E-05					
14	Cf	249	0.00E+00					
15	Cf	252	0.00E+00		Am241			
16	Cm	244	3.93E-07		Pu238	8.02E-09	2	6.74E-03
17	Cm	246	3.93E-07		Pu239			
18	Co	60	1.02E-04					
19	Cs	137						
20	H	3						
21	Np	237	1.89E-05					
22	Pm	147	0.00E+00					
23	Pu	238	3.72E-08	4.61E-02	1.72E-09			
24	Pu	239	3.72E-08	1.20E-04	4.48E-12			
25	Pu	39/241	3.72E-08					
26	Pu	240	3.72E-08	6.92E-03	2.58E-10			
27	Pu	241	3.72E-08	9.28E-01	3.46E-08	3.46E-08	120	9.39E-02
28	Pu	242	3.72E-08	4.38E-04	1.63E-11			
29	Sr	90						
30	Tc	99	1.02E-01					
31	Th	232	9.18E-07					
32	Ti	204	0.00E+00					
33	U	235	4.23E-06					
34	U	238	4.23E-06					

	A	B	H	I	J	K	L	M
2	Produce-root uptake							
3								
4								
5								
6								
7								
8	Element	At. No.						
9								
10	Am	241	T=B/280					
11	Am	243	=F10/280					
12	Ba	133	=F11/280					
13	Ce	144	=F12/280					
14	Cf	249	=F13/280					
15	Cf	252	=F14/280					
16	Cm	244	=F15/280					
17	Cm	246	=F16/280					
18	Co	60	=F17/280					
19	Cs	137	=F18/280					
20	H	3						
21	Np	237	=F21/280					
22	Pm	147	=F22/280					
23	Pu	238	=F23/280					
24	Pu	239	=F24/280					
25	Pu	239/241	=F25/280					
26	Pu	240	=F26/280					
27	Pu	241	=F27/280					
28	Pu	242	=F28/280					
29	Sr	90						
30	Tc	99	=F30/280					
31	Th	232	=F31/280					
32	Tl	204	=F32/280					
33	U	235	=F33/280					
34	U	238	=F34/280					

Attachment M

External contamination of leafy vegetables during harvest spreadsheet calculations

	A	B	H	I	J	K	L	M
2	Produce-soil adhesion							
3						Group	Group DIL	Total
4						sum		Dep for
5							Bq/kg	DIL
6				Unit	T x DEP			Ci/m2
7				Release	Ci/kg	Ci/kg		
8	Element	At. No.	T=DxF/280	Fraction				
9				Ci/m2				
10	Am	241	5.10204E-06	1.87E-02	9.54E-08			
11	Am	243	5.10204E-06					
12	Ba	133	5.10204E-06					
13	Ce	144	5.10204E-06					
14	Cf	249	5.10204E-06					
15	Cf	252	5.10204E-06		Am241			
16	Cm	244	5.10204E-06		Pu238	3.31E-07	2	1.63E-04
17	Cm	246	5.10204E-06		Pu239			
18	Co	60	5.10204E-06					
19	Cs	137	5.10204E-06					
20	H	3	5.10204E-06					
21	Np	237	5.10204E-06					
22	Pm	147	5.10204E-06					
23	Pu	238	5.10204E-06	4.61E-02	2.35E-07			
24	Pu	239	5.10204E-06	1.20E-04	6.14E-10			
25	Pu	239/241	5.10204E-06					
26	Pu	240	5.10204E-06	6.92E-03	3.53E-08			
27	Pu	241	5.10204E-06	9.28E-01	4.73E-06	4.73E-06	120	6.85E-04
28	Pu	242	5.10204E-06	4.38E-04	2.24E-09			
29	Sr	90	5.10204E-06					
30	Tc	99	5.10204E-06					
31	Th	232	5.10204E-06					
32	Tl	204	5.10204E-06					
33	U	235	5.10204E-06					
34	U	238	5.10204E-06					

	A	B	H	I	J	K	L	M
2	Produce-soil adhesion							
3						Group	Group	Total
4						sum	DIL	Dep for
5							Bq/kg	DIL
6				Unit	T x DEP			Ci/m2
7				Release	Ci/kg	Ci/kg		
8	Element	At. No.	T=DxF/280	Fraction				
9				Ci/m2				
10	Am	241	=D10*F10/280	=Quantities!\$I10	=H10*I10			
11	Am	243	=D11*F11/280					
12	Ba	133	=D12*F12/280					
13	Ce	144	=D13*F13/280					
14	Cf	249	=D14*F14/280					
15	Cf	252	=D15*F15/280		Am241			
16	Cm	244	=D16*F16/280		Pu238	=J10+J23+J24	2	=L16/K16/37000000000
17	Cm	246	=D17*F17/280		Pu239			
18	Co	60	=D18*F18/280					
19	Cs	137	=D19*F19/280					
20	H	3	=D20*F20/280					
21	Np	237	=D21*F21/280					
22	Pm	147	=D22*F22/280					
23	Pu	238	=D23*F23/280	=Quantities!\$I23	=H23*I23			
24	Pu	239	=D24*F24/280	=Quantities!\$I24	=H24*I24			
25	Pu	239/241	=D25*F25/280					
26	Pu	240	=D26*F26/280	=Quantities!\$I26	=H26*I26			
27	Pu	241	=D27*F27/280	=Quantities!\$I27	=H27*I27	=J27	120	=L27/K27/37000000000
28	Pu	242	=D28*F28/280	=Quantities!\$I28	=H28*I28			
29	Sr	90	=D29*F29/280					
30	Tc	99	=D30*F30/280					
31	Th	232	=D31*F31/280					
32	Tl	204	=D32*F32/280					
33	U	235	=D33*F33/280					
34	U	238	=D34*F34/280					

Attachment N

External contamination of grain spreadsheet calculations

	A	B	H	I	J	K	L	M
2	Grain-direct deposition							
3						Group	Group DIL	Total
4						sum		Dep for
5			m2/kg				Bq/kg	DIL
6				Unit	T x DEP			Ci/m2
7				Release	Ci/kg	Ci/kg		
8	Element	At. No.	T	Fraction				
9				Ci/m2				
10	Am	241	0.285714	1.87E-02	5.34E-03			
11	Am	243	0.285714					
12	Ba	133	0.285714					
13	Ce	144	0.285714					
14	Cf	249	0.285714					
15	Cf	252	0.285714		Am241			
16	Cm	244	0.285714		Pu238	1.85E-02	2	2.91E-09
17	Cm	246	0.285714		Pu239			
18	Co	60	0.285714					
19	Cs	137	0.285714					
20	H	3	0.285714					
21	Np	237	0.285714					
22	Pm	147	0.285714					
23	Pu	238	0.285714	4.61E-02	1.32E-02			
24	Pu	239	0.285714	1.20E-04	3.44E-05			
25	Pu	239/241	0.285714					
26	Pu	240	0.285714	6.92E-03	1.98E-03			
27	Pu	241	0.285714	9.28E-01	2.65E-01	2.65E-01	120	1.22E-08
28	Pu	242	0.285714	4.38E-04	1.25E-04			
29	Sr	90	0.285714					
30	Tc	99	0.285714					
31	Th	232	0.285714					
32	Tl	204	0.285714					
33	U	235	0.285714					
34	U	238	0.285714					

	A	B	H	I	J	K	L	M
2	Grain-direct deposition							
3						Group	Group DIL	Total
4						sum		Dep for
5			m2/kg				Bq/kg	DIL
6				Unit	T x DEP			Ci/m2
7				Release	Ci/kg	Ci/kg		
8	Element	At. No.	T	Fraction				
9				Ci/m2				
10	Am	241	=D10/E10	=Quantities!\$I10	=H10*I10			
11	Am	243	=D11/E11					
12	Ba	133	=D12/E12					
13	Ce	144	=D13/E13					
14	Cf	249	=D14/E14					
15	Cf	252	=D15/E15		Am241			
16	Cm	244	=D16/E16		Pu238	=J10+J23+J24	2	=L16/K16/370000000000
17	Cm	246	=D17/E17		Pu239			
18	Co	60	=D18/E18					
19	Cs	137	=D19/E19					
20	H	3	=D20/E20					
21	Np	237	=D21/E21					
22	Pm	147	=D22/E22					
23	Pu	238	=D23/E23	=Quantities!\$I23	=H23*I23			
24	Pu	239	=D24/E24	=Quantities!\$I24	=H24*I24			
25	Pu	239/241	=D25/E25					
26	Pu	240	=D26/E26	=Quantities!\$I26	=H26*I26			
27	Pu	241	=D27/E27	=Quantities!\$I27	=H27*I27	=J27	120	=L27/K27/370000000000
28	Pu	242	=D28/E28	=Quantities!\$I28	=H28*I28			
29	Sr	90	=D29/E29					
30	Tc	99	=D30/E30					
31	Th	232	=D31/E31					
32	Ti	204	=D32/E32					
33	U	235	=D33/E33					
34	U	238	=D34/E34					

Attachment O

Internal contamination of grain by root uptake spreadsheet calculations

	A	B	H	I	J	K	L	M
2	Grain-root uptake							
3						Group	Group DIL	Total
4						sum		Dep for
5							Bq/kg	DIL
6			m2/kg	Unit	T x DEP			Ci/m2
7				Release	Ci/kg	Ci/kg		
8	Element	At. No.	T=B/280	Fraction				
9				Ci/m2				
10	Am	241	6.76E-08	1.87E-02	1.26E-09			
11	Am	243	6.76E-08					
12	Ba	133	9.21E-05					
13	Ce	144	9.21E-05					
14	Cf	249						
15	Cf	252			Am241			
16	Cm	244	6.45E-08		Pu238	2.48E-09	2	2.18E-02
17	Cm	246	6.45E-08		Pu239			
18	Co	60	1.14E-05					
19	Cs	137						
20	H	3						
21	Np	237	8.29E-06					
22	Pm	147						
23	Pu	238	2.64E-08	4.61E-02	1.22E-09			
24	Pu	239	2.64E-08	1.20E-04	3.18E-12			
25	Pu	239/241	2.64E-08					
26	Pu	240	2.64E-08	6.92E-03	1.83E-10			
27	Pu	241	2.64E-08	9.28E-01	2.45E-08	2.45E-08	120	1.32E-01
28	Pu	242	2.64E-08	4.38E-04	1.16E-11			
29	Sr	90	0.00E+00					
30	Tc	99	2.24E-03					
31	Th	232	1.04E-07					
32	Tl	204	0.00E+00					
33	U	235	3.99E-06					
34	U	238	3.99E-06					

	A	B	H	I	J	K	L	M
2	Grain-root uptake							
3								
4								
5								
6			m2/kg	Unit Release	T x DEP Ci/kg	Group sum Ci/kg	Group DIL Bq/kg	Total Dep for DIL Ci/m2
7				Fraction Ci/m2				
8	Element	At. No.						
9			T=B/280					
10	Am	241	=F10/280	=Quantities!\$I10	=H10*I10			
11	Am	243	=F11/280					
12	Ba	133	=F12/280					
13	Ce	144	=F13/280					
14	Cf	249						
15	Cf	252						
16	Cm	244	=F16/280		Am241			
17	Cm	246	=F17/280		Pu238	=J10+J23+J24	2	=L16/K16/370000000000
18	Co	60	=F18/280		Pu239			
19	Cs	137						
20	H	3						
21	Np	237	=F21/280					
22	Pm	147						
23	Pu	238	=F23/280	=Quantities!\$I23	=H23*I23			
24	Pu	239	=F24/280	=Quantities!\$I24	=H24*I24			
25	Pu		239/241 =F25/280					
26	Pu	240	=F26/280	=Quantities!\$I26	=H26*I26			
27	Pu	241	=F27/280	=Quantities!\$I27	=H27*I27			
28	Pu	242	=F28/280	=Quantities!\$I28	=H28*I28			
29	Sr	90	=F29/280					
30	Tc	99	=F30/280					
31	Th	232	=F31/280					
32	Ti	204	=F32/280					
33	U	235	=F33/280					
34	U	238	=F34/280					
							120	=L27/K27/370000000000

Attachment P

External contamination of grain during harvest spreadsheet calculations

	A	B	H	I	J	K	L	M
2	Grain-soil adhesion							
3						Group	Group DIL Total	
4						sum		Dep for
5							Bq/kg	DIL
6			m2/kg	Unit	T x DEP			Ci/m2
7				Release	Ci/kg	Ci/kg		
8	Element	At. No.	T=DxF/280	Fraction				
9				Ci/m2				
10	Am	241	1.22857E-05	1.87E-02	2.30E-07			
11	Am	243	1.22857E-05					
12	Ba	133	1.22857E-05					
13	Ce	144	1.22857E-05					
14	Cf	249	1.22857E-05					
15	Cf	252	1.22857E-05		Am241			
16	Cm	244	1.22857E-05		Pu238	7.98E-07	2	6.78E-05
17	Cm	246	1.22857E-05		Pu239			
18	Co	60	1.22857E-05					
19	Cs	137	1.22857E-05					
20	H	3	1.22857E-05					
21	Np	237	1.22857E-05					
22	Pm	147	1.22857E-05					
23	Pu	238	1.22857E-05	4.61E-02	5.66E-07			
24	Pu	239	1.22857E-05	1.20E-04	1.48E-09			
25	Pu	239/241	1.22857E-05					
26	Pu	240	1.22857E-05	6.92E-03	8.50E-08			
27	Pu	241	1.22857E-05	9.28E-01	1.14E-05	1.14E-05	120	2.85E-04
28	Pu	242	1.22857E-05	4.38E-04	5.38E-09			
29	Sr	90	1.22857E-05					
30	Tc	99	1.22857E-05					
31	Th	232	1.22857E-05					
32	Tl	204	1.22857E-05					
33	U	235	1.22857E-05					
34	U	238	1.22857E-05					

	A	B	H	I	J	K	L	M
2	Grain-soil adhesion							
3						Group	Group DIL	Total
4						sum		Dep for
5							Bq/kg	DIL
6			m2/kg	Unit	T x DEP			Ci/m2
7				Release	Ci/kg	Ci/kg		
8	Element	At. No.	T=Dx F/280	Fraction				
9				Ci/m2				
10	Am	241	=D10*F10/280	=Quantities!\$I10	=H10*I10			
11	Am	243	=D11*F11/280					
12	Ba	133	=D12*F12/280					
13	Ce	144	=D13*F13/280					
14	Cf	249	=D14*F14/280					
15	Cf	252	=D15*F15/280		Am241			
16	Cm	244	=D16*F16/280		Pu238	=J10+J23+J24	2	=L16/K16/37000000000
17	Cm	246	=D17*F17/280		Pu239			
18	Co	60	=D18*F18/280					
19	Cs	137	=D19*F19/280					
20	H	3	=D20*F20/280					
21	Np	237	=D21*F21/280					
22	Pm	147	=D22*F22/280					
23	Pu	238	=D23*F23/280	=Quantities!\$I23	=H23*I23			
24	Pu	239	=D24*F24/280	=Quantities!\$I24	=H24*I24			
25	Pu	239/241	=D25*F25/280					
26	Pu	240	=D26*F26/280	=Quantities!\$I26	=H26*I26			
27	Pu	241	=D27*F27/280	=Quantities!\$I27	=H27*I27	=J27	120	=L27/K27/37000000000
28	Pu	242	=D28*F28/280	=Quantities!\$I28	=H28*I28			
29	Sr	90	=D29*F29/280					
30	Tc	99	=D30*F30/280					
31	Th	232	=D31*F31/280					
32	Tl	204	=D32*F32/280					
33	U	235	=D33*F33/280					
34	U	238	=D34*F34/280					

Attachment Q

Contamination of beverages spreadsheet calculations

	A	B	D	E	F	G	H	I
2	Beverage		1000 kg					
3			per			Group	Group DIL	Total
4			m3			sum		Dep for
5							Bq/L	DIL
6				Unit	T x DEP			Ci/m2
7				Release	Ci/L	Ci/L		
8	Element	At. No.	T (m2/L)	Fraction				
9				Ci/m2				
10	Am	241	0.001	1.87E-02	1.87E-05			
11	Am	243	0.001					
12	Ba	133	0.001					
13	Ce	144	0.001					
14	Cf	249	0.001					
15	Cf	252	0.001		Am241			
16	Cm	244	0.001		Pu238	6.49E-05	2	8.33E-07
17	Cm	246	0.001		Pu239			
18	Co	60	0.001					
19	Cs	137	0.001					
20	H	3	0.001					
21	Np	237	0.001					
22	Pm	147	0.001					
23	Pu	238	0.001	4.61E-02	4.61E-05			
24	Pu	239	0.001	1.20E-04	1.20E-07			
25	Pu	239/241	0.001					
26	Pu	240	0.001	6.92E-03	6.92E-06			
27	Pu	241	0.001	9.28E-01	9.28E-04	9.28E-04	120	3.50E-06
28	Pu	242	0.001	4.38E-04	4.38E-07			
29	Sr	90	0.001					
30	Tc	99	0.001					
31	Th	232	0.001					
32	Tl	204	0.001					
33	U	235	0.001					
34	U	238	0.001					

	A	B	D	E	F	G	H	I
2	Beverage		1000 kg					
3			per			Group	Group DIL	Total
4			m3			sum		Dep for
5							Bq/L	DIL
6				Unit	T x DEP			Ci/m2
7				Release	Ci/L	Ci/L		
8	Element	At. No.	T (m2/L)	Fraction				
9				Ci/m2				
10	Am	241	=1/1000	=Quantities!\$I10	=D10*E10			
11	Am	243	=1/1000					
12	Ba	133	=1/1000					
13	Ce	144	=1/1000					
14	Cf	249	=1/1000					
15	Cf	252	=1/1000		Am241			
16	Cm	244	=1/1000		Pu238	=F10+F23+F24	2	=H16/G16/37000000000
17	Cm	246	=1/1000		Pu239			
18	Co	60	=1/1000					
19	Cs	137	=1/1000					
20	H	3	=1/1000					
21	Np	237	=1/1000					
22	Pm	147	=1/1000					
23	Pu	238	=1/1000	=Quantities!\$I23	=D23*E23			
24	Pu	239	=1/1000	=Quantities!\$I24	=D24*E24			
25	Pu	239/241	=1/1000					
26	Pu	240	=1/1000	=Quantities!\$I26	=D26*E26			
27	Pu	241	=1/1000	=Quantities!\$I27	=D27*E27	=F27	120	=H27/G27/37000000000
28	Pu	242	=1/1000	=Quantities!\$I28	=D28*E28			
29	Sr	90	=1/1000					
30	Tc	99	=1/1000					
31	Th	232	=1/1000					
32	Tl	204	=1/1000					
33	U	235	=1/1000					
34	U	238	=1/1000					

Attachment R

HOTSPOT results - average meteorology, 0.1 cm s^{-1}

The 0.177 $\mu\text{Ci m}^{-2}$ area value above is not used. It is erroneously displayed as zero because of the coarse grid spacing. This case was rerun to give more a more accurate area calculation.

This plot was used for the $0.177 \mu\text{Ci m}^{-2}$ area value.

Attachment S

HOTSPOT results - average meteorology, 1.0 cm s^{-1}

Attachment T

HOTSPOT results - average meteorology, 10 cm s^{-1}

CONTOUR LEGEND : microcuries per square meter

INNER: 84.700 MIDDLE: 67.800 OUTER: 16.700

FILTER EFFICIENCY : 0.000000 %
EFFECTIVE RELEASE HEIGHT : 0.0 m
WIND SPEED (h = 2 m) : 2.50 m/s

STABILITY CLASS (city) : C

RECEPTOR HEIGHT : 0.0 m
INVERSION LAYER HEIGHT : 500.0 m

SOURCE TERM : 3.510E+01 Ci
RELEASE FRACTION : 1.000E+00
SAMPLE TIME : 120.000 min

FILTER EFFICIENCY : 0.000000 %
EFFECTIVE RELEASE HEIGHT : 0.0 m
WIND SPEED (h = 2 m) : 2.50 m/s

STABILITY CLASS (city) : C

RECEPTOR HEIGHT : 0.0 m
INVERSION LAYER HEIGHT : 500.0 m

SOURCE TERM : 3.510E+01 Ci
RELEASE FRACTION : 1.000E+00
SAMPLE TIME : 120.000 min

Attachment U

HOTSPOT results - adverse meteorology, 0.1 cm s^{-1}

INNER Area : 7.3E-01 km²
 MIDDLE Area : 2.2E+01 km²
 OUTER Area : 6.0E+02 km²

CONTOUR LEGEND : microcuries per square meter

INNER: 0.177 MIDDLE: 0.028 OUTER: 0.003

FILTER EFFICIENCY : 0.000000 %
 EFFECTIVE RELEASE HEIGHT : 0.0 m
 WIND SPEED (h = 2 m) : 1.70 m/s

STABILITY CLASS (city) : E

RECEPTOR HEIGHT : 0.0 m
 INVERSION LAYER HEIGHT : 200.0 m

SOURCE TERM : 3.510E+01 Ci
 RELEASE FRACTION : 1.000E+00
 SAMPLE TIME : 120.000 min

FILTER EFFICIENCY : 0.000000 %
 EFFECTIVE RELEASE HEIGHT : 0.0 m
 WIND SPEED (h = 2 m) : 1.70 m/s

STABILITY CLASS (city) : E

RECEPTOR HEIGHT : 0.0 m
 INVERSION LAYER HEIGHT : 200.0 m

SOURCE TERM : 3.510E+01 Ci
 RELEASE FRACTION : 1.000E+00
 SAMPLE TIME : 120.000 min

Attachment V

HOTSPOT results - adverse meteorology, 1.0 cm s^{-1}

CONTOUR LEGEND : microcuries per square meter

INNER: 84.700 MIDDLE: 67.800 OUTER: 16.700

FILTER EFFICIENCY : 0.000000 %
EFFECTIVE RELEASE HEIGHT : 0.0 m
WIND SPEED (h = 2 m) : 1.70 m/s
STABILITY CLASS (city) : E
RECEPTOR HEIGHT : 0.0 m
INVERSION LAYER HEIGHT : 200.0 m

SOURCE TERM : 3.510E+01 Ci
RELEASE FRACTION : 1.000E+00
SAMPLE TIME : 120.000 min

FILTER EFFICIENCY : 0.000000 %
EFFECTIVE RELEASE HEIGHT : 0.0 m
WIND SPEED (h = 2 m) : 1.70 m/s
STABILITY CLASS (city) : E
RECEPTOR HEIGHT : 0.0 m
INVERSION LAYER HEIGHT : 200.0 m

SOURCE TERM : 3.510E+01 Ci
RELEASE FRACTION : 1.000E+00
SAMPLE TIME : 120.000 min

AREA : 3.7E-03 km2

CONTOUR LEGEND : microcuries per square meter
163.000

FILTER EFFICIENCY : 0.000000 %
EFFECTIVE RELEASE HEIGHT : 0.0 m
WIND SPEED (h = 2 m) : 1.70 m/s
STABILITY CLASS (city) : E
RECEPTOR HEIGHT : 0.0 m
INVERSION LAYER HEIGHT : 200.0 m

SOURCE TERM : 3.510E+01 Ci
RELEASE FRACTION : 1.000E+00
SAMPLE TIME : 120.000 min

FILTER EFFICIENCY : 0.000000 %
EFFECTIVE RELEASE HEIGHT : 0.0 m
WIND SPEED (h = 2 m) : 1.70 m/s
STABILITY CLASS (city) : E
RECEPTOR HEIGHT : 0.0 m
INVERSION LAYER HEIGHT : 200.0 m

SOURCE TERM : 3.510E+01 Ci
RELEASE FRACTION : 1.000E+00
SAMPLE TIME : 120.000 min

Attachment W

HOTSPOT results - adverse meteorology, 10 cm s^{-1}

CONTOUR LEGEND : microcuries per square meter

INNER: 84.700 MIDDLE: 67.800 OUTER: 16.700

FILTER EFFICIENCY : 0.000000 %
EFFECTIVE RELEASE HEIGHT : 0.0 m
WIND SPEED (h = 2 m) : 1.70 m/s
STABILITY CLASS (city) : E
RECEPTOR HEIGHT : 0.0 m
INVERSION LAYER HEIGHT : 200.0 m

SOURCE TERM : 3.510E+01 Ci
RELEASE FRACTION : 1.000E+00
SAMPLE TIME : 120.000 min

FILTER EFFICIENCY : 0.000000 %
EFFECTIVE RELEASE HEIGHT : 0.0 m
WIND SPEED (h = 2 m) : 1.70 m/s
STABILITY CLASS (city) : E
RECEPTOR HEIGHT : 0.0 m
INVERSION LAYER HEIGHT : 200.0 m

SOURCE TERM : 3.510E+01 Ci
RELEASE FRACTION : 1.000E+00
SAMPLE TIME : 120.000 min

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