

VIRGINIA POWER  
SURRY POWER STATION

10CFR61

RADIOACTIVE WASTE CLASSIFICATION  
SCALING FACTOR EVALUATION

SEPTEMBER, 1985

8604220264 851025  
PDR ADOCK 05000280  
Q PDR

**Cm-243 (Cm-244) in Primary Resin (Key Isotope : Co-60)**

The unmodified S.F. was  $1.1\text{E}-06$ ; however, this resulted in a nonconservative calculated isotopic concentration for samples 10446, and 10556, of which only 10556 was out of spec. Since 61-1088 was the only sample containing a LLD value for the isotope, it was eliminated from the calculations to provide a conservative scaling factor of  $1.9\text{E}-06$ .

**VIRGINIA POWER  
SURRY POWER STATION**

**10CFR61**

**RADIOACTIVE WASTE CLASSIFICATION  
SCALING FACTOR EVALUATION**

**SEPTEMBER, 1985**

## INTRODUCTION

10CFR61.55, "Waste Classification", provides in part that, "The concentration of a radionuclide may be determined by indirect methods such as the use of scaling factors which relate the inferred concentration of one radionuclide to another that is measured,....if there is reasonable assurance that the indirect methods can be correlated with actual measurements". Based on recent NRC guidance which suggested that Scaling Factor (S.F.) correlations, wherever possible, be accurate within a factor of 10, the station's S.F. development methodology was modified to improve results. Using log normal averaging of inferred nuclide to scaling nuclide ratios, the waste sample analysis data compiled during the two year collection period of 1983 and 1984 was evaluated to determine S.F.s which would most accurately correlate with sample results. This evaluation provided acceptable S.F.s for classification of wastes in four distinct waste streams; dry active waste (DAW), liquid waste processing resins (Liquid Waste), primary loop filter media (Primary Filter) and primary loop purification resins (Primary Resins).

## DISCUSSION

A review of the data collected during 1983 and 1984 was performed initially to ensure awareness of those factors with potential for undue influence on correlation accuracy. These factors included: sample size, activity and representativeness, laboratory analysis sensitivity and the percentage of positive analytical results vs. those below the lower limit of detection (<LLD) for samples within each waste stream. The factors identified as having greatest influence on correlation accuracy are as follows.

- (i) The samples collected during 1983 and 1984 were analyzed by two different vendor laboratories. Sample quantities provided to the laboratory utilized during 1983 were extremely small due to activity restrictions contained in the vendor's by-product material license. For 1984, a different vendor was located with far less restrictive license conditions. The analysis results reported by these two vendors were observed in several instances to compare unfavorably due to the effect on analytical sensitivity of reduced sample quantity.

(ii) Samples collected from the Liquid Waste stream during 1983 and 1984 were observed to correlate poorly for several radionuclides. Investigation revealed that the 1983 samples consisted of small quantities of specific types of ion exchange resin media (e.g., anion, cation, etc.). In 1984, a sample of mixed resin was obtained from an actual shipment container. This type of sample is considered more representative of typical waste shipments and, thus, was given more weight during scaling factor evaluation.

The development of scaling factors required a two phase evaluation. First, all sample data <sup>were</sup> ~~was~~ assembled by waste stream and nuclide of interest. The log normal average of all inferred nuclides to scaling nuclide ratios was calculated for each group of data. This value (the scaling factor) was then used to calculate inferred nuclide concentrations. The factor difference between measured and calculated nuclide concentrations was determined to assess correlation accuracy, with a negative sign applied to nonconservative correlations. In the second phase, correlation accuracy was reviewed for each data group. In each case where nonconservative correlations were observed to exceed a factor of 10, the data group was reevaluated to determine if improvement was possible. The influence of <LLD results and sample results with questionable reliability or representativeness were observed to contribute to poor correlation in a number of data groups requiring reevaluation. Where improvement would occur, these results were eliminated from the data group and a modified scaling factor was calculated. In several cases, however, elimination of <LLD results would have provided further nonconservatism thus, the original scaling factor was retained. Additionally, a small number of cases which were reevaluated exhibited no suspect data and presented no logical method for improving correlations. Here also, the original scaling factor was retained.

Displayed in the attached tables are the results of the scaling factor development described above. The first table provides a summary of the final waste classification scaling factors for each of the four waste streams. The tables which follow provide detailed calculational results of the evaluation, organized by waste stream and radionuclide. Footnotes are provided, as necessary, to describe the results of reevaluations performed to address nonconservative correlations.

### CONCLUSIONS:

While the S.F. development methodology used was unable to achieve total conformance with the correlation accuracy goal, those few correlations which remain nonconservative by greater than a factor of 10 were closely evaluated and are not considered to invalidate the final S.F.s accepted. S.F.s will be reevaluated and updated on an annual basis to assure currency.

Surry Power Station Rad. Waste Classification Sealing Factors

10 CFR 61					
Isotope	Key Isotope	DAW	Liq. Waste	Prim. Filter	Prim. Resin
Sr-90	Cs-137	5.86E-03	2.04E-02	4.02E-02	4.88E-03
Tc-99	Cs-137	6.35E-04	6.34E-04	1.82E+00	5.89E-03
I-129	Cs-137	2.40E-04	2.09E-04	1.03E-03	6.85E-06
C-14	Co-60	8.14E-01	1.33E-02	2.93E-02	1.79E-04
Fe-55	Co-60	6.44E-01	7.58E-01	3.07E-01	2.98E-02
Ni-63	Co-60	3.68E-01	4.03E-01	1.84E-01	3.56E-01
Pu-241	Ce-144	1.58E+00	7.67E-01	3.36E-01	3.20E-01
Cm-242	Co-60	5.93E-02	9.15E-03	2.12E-03	7.61E-04
	Ce-144	3.88E-03	1.36E-02	2.50E-03	2.46E-03
Pu-238	Co-60	1.44E-04	1.62E-04	1.58E-05	5.85E-06
	Ce-144	1.03E-02	7.11E-03	2.63E-03	3.96E-03
Am-241	Co-60	3.80E-04	8.49E-05	1.66E-05	9.39E-06
	Ce-144	3.41E-03	3.15E-03	1.14E-03	8.58E-04
Pu-239 & Pu-240	Co-60	1.26E-04	3.76E-05	7.19E-06	2.04E-06
	Ce-144	1.73E-02	5.87E-03	1.91E-03	2.17E-03
Pu-242 & Np-237	Co-60	6.39E-04	7.00E-05	1.20E-05	5.16E-06
	Ce-144	8.58E-04	4.58E-04	3.69E-05	4.17E-05
Cm-243 & Cm-244	Co-60	3.18E-05	5.47E-06	2.33E-07	9.89E-08
	Ce-144	1.82E-03	3.95E-03	9.01E-04	4.63E-04
	Co-60	6.72E-05	4.59E-05	5.68E-06	1.88E-06

## DAW Scaling Factor Evaluation



Sample Number	Isotope Conc.	Cs-137		log Iso/Key	Average Scaling Factor	Calculated Iso. Conc.	Iso vs. Calc. Factor
		Key Iso. Conc.	Iso/Key Ratio				
10397	1.2E-04	2.1E-01	5.7E-04	-3.2	5.9E-03	1.2E-03	10.3
10398	9.6E-05	1.3E-02	7.5E-03	-2.1	5.9E-03	7.5E-05	-1.3
61-1093	1.6E-02	3.4E-01	4.7E-02	-1.3	5.9E-03	2.0E-03	-8.0

No out of spec. nonconservative correlations are observed

Sample Number	Isotope Conc.	Cs-137			Average Scaling		Calculated	Iso vs. Calc.
		Key Iso. Conc.	Iso/Key Ratio	log Iso/Key	Factor	Iso. Conc.	Factor	
10397	< 4.2E-05	2.1E-01	2.0E-04	-3.7	6.4E-04	1.3E-04	3.2	
10398	< 2.0E-05	1.3E-02	1.6E-03	-2.8	6.4E-04	8.1E-06	-2.5	
61-1093	2.8E-04	3.4E-01	8.2E-04	-3.1	6.4E-04	2.2E-04	-1.3	

Sample Number	Cs-137				Average Scaling		Calculated		Iso vs. Calc.	
	Isotope Conc.	Key Iso. Conc.	Iso/Key Ratio	log Iso/Key	Factor		Iso. Conc.		Factor	
10397	< 4.2E-05	2.1E-01	2.0E-04	-3.7	2.4E-04		5.1E-05		1.2	
10398	< 8.9E-05	1.3E-02	7.0E-03	-2.2	2.4E-04		3.1E-06		-29.0	
61-1093	< 3.4E-06	3.4E-01	1.0E-05	-5.0	2.4E-04		8.2E-05		24.0	

Since I-129 was <LLD in all samples, no other satisfactory Scaling Factor can be realized.

Sample Number	Co-60				Average Scaling Factor	Calculated Iso. Conc.	Iso vs. Calo. Factor
	Isotope Conc.	Key Iso. Conc.	Iso/Key Ratio	log Iso/Key			
10397	3.4E-01	9.9E-02	3.5E+00	0.5	8.1E-01	8.0E-02	-4.3
10398	1.6E-03	8.4E-03	1.9E-01	-0.7	8.1E-01	6.8E-03	4.3
61-1093	1.4E-03	2.9E-01	Eliminated	N.A.	8.1E-01	2.4E-01	168.7

C-14 in DAW-Unmanned Scaling Factor

Sample Number	Isotope Conc.	Co-60		log Iso/Key	Average Scaling Factor	Calculated Iso. Conc.	Iso vs. Calc. Factor
		Key Iso. Conc.	Iso/Key Ratio				
10397	3.4E-01	9.9E-02	3.5E+00	0.5	1.5E-01	1.5E-02	-23.5
10398	1.6E-03	8.4E-03	1.9E-01	-0.7	1.5E-01	1.2E-03	-1.3
61-1093	1.4E-03	2.9E-01	4.8E-03	-2.3	1.5E-01	4.3E-02	30.5

#### C-14 in DAW

The unmodified S.F. was  $1.5\text{E}-01$ ; however, this resulted in a nonconservative calculated isotopic concentration for sample 10397, due to the influence of the  $\Delta\text{LLD}$  value of sample 61-1093. Therefore, the S.F. was recalculated using the values of samples 10397 and 10398, resulting with a conservative factor of  $8.1\text{E}-01$ .

Sample Number	Isotope Conc.	Co-60			Average Scaling		Calculated	Iso vs. Calc.
		Key Iso. Conc.	Iso/Key Ratio	log Iso/Key	Factor	Iso. Conc.	Factor	
10397	1.3E-01	9.9E-02	1.3E+00	0.1	6.4E-01	6.3E-02	-2.1	
10398	9.9E-03	8.4E-03	1.2E+00	0.1	6.4E-01	5.4E-03	-1.8	
61-1093	4.9E-02	2.9E-01	1.7E-01	-0.8	6.4E-01	1.9E-01	3.8	

Ni-63

Sample Number	Co-60				Average Scaling		Iso vs. Calc.	
	Isotope Conc.	Key Iso. Conc.	Iso/Key Ratio	log Iso/Key	Factor	Calculated Iso. Conc.	Factor	
10397	4.4E-02	9.9E-02	4.5E-01	-0.3	3.7E-01	3.6E-02	-1.2	
10398	8.7E-03	8.4E-03	1.0E+00	0.0	3.7E-01	3.1E-03	-2.8	
61-1093	3.1E-02	2.9E-01	1.1E-01	-1.0	3.7E-01	1.1E-01	3.4	



Pu-241 in DAW (Isotope : Ce-144)

Sample Number	Isotope Conc.	Ce-144		log Iso/Key	Average Scaling Factor	Calculated Iso. Conc.	Iso vs. Calc. Factor
		Key Iso. Conc.	Iso/Key Ratio				
10397	1.4E-03	1.9E-03	7.4E-01	-0.1	1.6E+00	3.0E-03	2.1
10398	3.6E-03	< 9.8E-05	3.7E+01	1.6	1.6E+00	1.5E-04	-23.3
61-1093	9.4E-03	6.5E-02	1.4E-01	-0.8	1.6E+00	1.0E-01	10.9

Elimination of the Ce-144 <LLD value of sample 10398 would result in a less conservative Scaling Factor

Pu-241 in DAW (Key Isotope : Co-60)

Sample Number	Isotope Conc.	Co-60			Average Scaling Factor	Calculated Iso. Conc.	Iso vs. Calc. Factor
		Key Iso. Conc.	Iso/Key Ratio	log Iso/Key			
10397	1.4E-03	9.9E-02	1.4E-02	-1.8	5.8E-02	5.7E-03	4.1
10398	3.6E-03	8.4E-03	4.3E-01	-0.4	5.8E-02	4.9E-04	-7.4
61-1093	9.4E-03	2.9E-01	3.2E-02	-1.5	5.8E-02	1.7E-02	1.8

Cm-242 in DAW (Key Isope : Ce-144)

Sample Number	Isotope Conc.	Ce-144			Average Scaling Factor	Calculated Iso. Conc.	Iso vs. Calo. Factor
		Key Iso. Conc.	Iso/Key Ratio	log Iso/Key			
10397	1.6E-05	1.9E-03	8.4E-03	-2.1	3.9E-03	7.4E-06	-2.2
10398	8.5E-07	9.8E-05	8.7E-03	-2.1	3.9E-03	3.8E-07	-2.2
61-1093	5.2E-05	6.5E-02	8.0E-04	-3.1	3.9E-03	2.5E-04	4.9

Cm-242 in DAW (Key Isotope : Co-60)

Sample Number	Isotope Conc.	Co-60		log Iso/Key	Average Scaling Factor	Calculated	Iso vs. Calc.
		Key Iso. Conc.	Iso/Key Ratio			Iso. Conc.	Factor
10397	1.6E-05	9.9E-02	1.6E-04	-3.8	1.4E-04	1.4E-05	-1.1
10398	8.5E-07	8.4E-03	1.0E-04	-4.0	1.4E-04	1.2E-06	1.4
61-1093	5.2E-05	2.9E-01	1.8E-04	-3.7	1.4E-04	4.2E-05	-1.2

Sample Number	Isotope Conc.	Ce-144		log Iso/Key	Average Scaling Factor	Calculated Iso. Conc.	Iso vs. Calc. Factor
		Key Iso. Conc.	Iso/Key Ratio				
10397	1.4E-05	1.9E-03	7.4E-03	-2.1	1.0E-02	2.0E-05	1.4
10398	1.1E-05	< 9.8E-05	1.1E-01	-0.9	1.0E-02	1.0E-06	-10.9
61-1093	8.5E-05	6.5E-02	1.3E-03	-2.9	1.0E-02	6.7E-04	7.8

Elimination of the values of sample 10398 due to <LLD of Ce-144 would provide a less conservative Scaling Factor

Pu-238 in DAW (Key Isotope : Co-60)

Sample Number	Isotope Conc.	Co-60		log Iso/Key	Average Scaling Factor	Calculated Iso. Conc.	Iso vs. Calc. Factor
		Key Iso. Conc.	Iso/Key Ratio				
10397	1.4E-05	9.9E-02	1.4E-04	-3.8	3.8E-04	3.7E-05	2.7
10398	1.1E-05	8.4E-03	1.3E-03	-2.9	3.8E-04	3.2E-06	-3.5
61-1093	8.5E-05	2.9E-01	2.9E-04	-3.5	3.8E-04	1.1E-04	1.3

Am-241 in DAW (Key Isotope : Ce-144)

Sample Number	Isotope Conc.	Ce-144		log Iso/Key	Average Scaling	Calculated	Iso vs. Calc.
		Key Iso. Conc.	Iso/Key Ratio		Factor	Iso. Conc.	Factor
10397	4.1E-06	1.9E-03	2.2E-03	-2.7	3.4E-03	6.5E-06	1.6
10398	2.3E-06	< 9.8E-05	2.3E-02	-1.6	3.4E-03	3.3E-07	-6.9
61-1093	5.1E-05	6.5E-02	7.8E-04	-3.1	3.4E-03	2.2E-04	4.3

Am-241 in DAY (Key Isotope : Co-60)

Sample Number	Isotope Conc.	Co-60			Average Scaling		Calculated	Iso vs. Calc.
		Key Iso. Conc.	Iso/Key Ratio	log Iso/Key	Factor	Iso. Conc.	Factor	
10397	4.1E-06	9.9E-02	4.2E-05	-4.4	1.3E-04	1.2E-05	3.0	
10398	2.3E-06	8.4E-03	2.8E-04	-3.6	1.3E-04	1.1E-06	-2.2	
61-1093	5.1E-05	2.9E-01	1.8E-04	-3.8	1.3E-04	3.7E-05	-1.4	



Pu-239 (Pu-240) in DA Isotope : Ce-144)

Sample Number	Isotope Conc.	Ce-144		log Iso/Key	Average Scaling Factor	Calculated Iso. Conc.	Iso vs. Calc. Factor
		Key Iso. Conc.	Iso/Key Ratio				
10397	4.3E-05	1.9E-03	2.3E-02	-1.6	1.7E-02	3.3E-05	-1.3
10398	6.3E-06	9.8E-05	6.4E-02	-1.2	1.7E-02	1.7E-06	-3.7
61-1093	2.3E-04	6.5E-02	3.5E-03	-2.5	1.7E-02	1.1E-03	4.9

Pu-239 (Pu-240) in DA Isotope : Co-60

Sample Number	Isotope Conc.	Co-60			Average Scaling Factor	Calculated Iso. Conc.	Iso vs. Calc. Factor
		Key Iso. Conc.	Iso/Key Ratio	log Iso/Key			
10397	4.3E-05	9.9E-02	4.4E-04	-3.4	6.4E-04	6.3E-05	1.5
10398	6.3E-06	8.4E-03	7.5E-04	-3.1	6.4E-04	5.3E-06	-1.2
61-1093	2.3E-04	2.9E-01	7.9E-04	-3.1	6.4E-04	1.9E-04	-1.2

Sample Number	Isotope Conc.	Ce-144		log Iso/Key	Average Scaling Factor	Calculated Iso. Conc.	Iso vs. Calc. Factor
		Key Iso. Conc.	Iso/Key Ratio				
10397	< 1.3E-06	1.9E-03	6.8E-04	-3.2	8.6E-04	1.6E-06	1.3
10398	< 1.4E-06	< 9.8E-05	1.4E-02	-1.8	8.6E-04	8.4E-08	-16.7
61-1093	< 4.2E-06	6.5E-02	6.5E-05	-4.2	8.6E-04	5.6E-05	13.3

Elimination of the <LLD values of sample 10398 would result in a less conservative Scaling Factor

Pu-242 (Np-237) in DA Key Isotope : Co-60)

Sample Number	Isotope Conc.	Co-60			Average Scaling Factor	Calculated Iso. Conc.	Iso vs. Calo. Factor
		Key Iso. Conc.	Iso/Key Ratio	log Iso/Key			
10397	1.3E-06	9.9E-02	1.3E-05	-4.9	3.2E-05	3.1E-06	2.4
10398	1.4E-06	8.4E-03	1.7E-04	-3.8	3.2E-05	2.7E-07	-5.3
61-1093	4.2E-06	2.9E-01	1.4E-05	-4.8	3.2E-05	9.2E-06	2.2

Cm-243 (Cm-244) in DA Isotope : Ce-144)

		Ce-144			Average Scaling	Calculated	Iso vs. Calc.
Sample Number	Isotope Conc.	Key Iso. Conc.	Iso/Key Ratio	log Iso/Key	Factor	Iso. Conc.	Factor
10397	3.4E-06	1.9E-03	1.8E-03	-2.7	1.8E-03	3.5E-06	1.0
10398	8.2E-07	9.8E-05	8.4E-03	-2.1	1.8E-03	1.8E-07	-4.6
61-1093	2.6E-05	6.5E-02	4.0E-04	-3.4	1.8E-03	1.2E-04	4.5

Cm-243 (Cm-244) in D Key Isotope : Co-60

Sample Number	Isotope Conc.	Co-60		log Iso/Key	Average Scaling		Iso vs. Calc.
		Key Iso. Conc.	Iso/Key Ratio		Factor	Calculated Iso. Conc.	
10397	3.4E-06	9.9E-02	3.5E-05	-4.5	6.7E-05	6.6E-06	1.9
10398	8.2E-07	8.4E-03	9.8E-05	-4.0	6.7E-05	5.6E-07	-1.5
61-1093	2.6E-05	2.9E-01	9.0E-05	-4.0	6.7E-05	1.9E-05	-1.3



## Liquid Waste Scaling Factor Evaluation

Sr-90 in Waste

Sample Number	Isotope Conc.	Cs-137			Average Scaling Factor	Calculated Iso. Conc.	Iso vs. Calo. Factor
		Key Iso. Conc.	Iso/Key Ratio	log Iso/Key			
10443	8.9E-06	3.1E-02	Eliminated	N.A.	2.0E-02	6.3E-04	70.3
10444	4.2E-05	2.6E-01	Eliminated	N.A.	2.0E-02	5.3E-03	125.6
10448	1.9E-05	8.1E-04	2.3E-02	-1.6	2.0E-02	1.7E-05	-1.1
61-1091	9.8E-03	5.5E-01	1.8E-02	-1.7	2.0E-02	1.1E-02	1.1

see attached explanation



Sr-90 in Liquid Waste Modified Scaling Factor

Sample Number	Cs-137				Average Scaling Factor	Calculated Iso. Conc.	Iso vs. Calc. Factor
	Isotope Conc.	Key Iso. Conc.	Iso/Key Ratio	log Iso/Key			
10443	8.9E-06	3.1E-02	2.9E-04	-3.5	2.1E-03	6.5E-05	7.3
10444	4.2E-05	2.6E-01	1.6E-04	-3.8	2.1E-03	5.4E-04	13.0
10448	1.9E-05	8.1E-04	2.3E-02	-1.6	2.1E-03	1.7E-06	-11.1
61-1091	9.8E-03	5.5E-01	1.8E-02	-1.7	2.1E-03	1.2E-03	-8.4

#### **Sr-90 in Liquid Waste**

The unmodified S.F. was  $2.1\text{E-}03$ ; however, this resulted in a nonconservative calculated isotopic concentration for sample 10448. Therefore, the S.F. was recalculated using the values of samples 10448 and 61-1091, resulting with a conservative factor of  $2.0\text{E-}02$ .

Sample Number	Isotope Conc.	Cs-137			Average Scaling Factor	Calculated Iso. Conc.	Iso vs. Calc. Factor
		Key Iso. Conc.	Iso/Key Ratio	log Iso/Key			
10443	2.5E-05	3.1E-02	8.2E-04	-3.1	6.3E-04	1.9E-05	-1.3
10444	2.5E-05	2.6E-01	9.7E-05	-4.0	6.3E-04	1.6E-04	6.5
10448	6.5E-06	8.1E-04	8.0E-03	-2.1	6.3E-04	5.1E-07	-12.7
61-1091	1.4E-04	5.5E-01	2.5E-04	-3.6	6.3E-04	3.5E-04	2.5

Due to influence of <LLD values of Tc-99, no other satisfactory Scaling Factors can be determined

Sample Number	Isotope Conc.	Cs-137			Average Scaling		Calculated		Iso vs. Calc.	
		Key Iso. Conc.	Iso/Key Ratio	log Iso/Key	Factor		Iso. Conc.		Factor	
10443	< 1.7E-06	3.1E-02	5.6E-05	-4.3	2.1E-04		6.4E-06		3.8	
10444	< 1.7E-06	2.6E-01	6.6E-06	-5.2	2.1E-04		5.4E-05		31.7	
10448	7.0E-05	8.1E-04	8.6E-02	-1.1	2.1E-04		1.7E-07		-413.1	
61-1091	< 3.3E-05	5.5E-01	6.0E-05	-4.2	2.1E-04		1.1E-04		3.5	

**I-129 in Liquid Waste**

The reported concentration of the key isotope of sample 10448 is suspect due to its low concentration relative to the other samples. As stated in the discussion, the most representative sample is 61-1091 due to its mixture characteristics as per typical shipments.

Sample Number	Isotope Conc.	Co-60			Average Scaling		Calculated	Iso vs. Calc.
		Key Iso. Conc.	Iso/Key Ratio	log Iso/Key	Factor	Iso. Conc.	Factor	
10443	1.8E-04	4.8E-02	3.7E-03	-2.4	1.3E-02	6.4E-04	3.5	
10444	7.2E-04	1.2E-01	6.0E-03	-2.2	1.3E-02	1.6E-03	2.2	
10448	7.3E-04	1.6E-02	4.7E-02	-1.3	1.3E-02	2.1E-04	-3.5	
61-1091	2.0E-02	6.8E-01	2.9E-02	-1.5	1.3E-02	9.0E-03	-2.2	

Fe-55 in Liquid Waste

Sample Number	Co-60				Average Scaling Factor	Calculated Iso. Conc.	Iso vs. Calc. Factor
	Isotope Conc.	Key Iso. Conc.	Iso/Key Ratio	log Iso/Key			
10443	4.1E-02	4.8E-02	8.6E-01	-0.1	7.6E-01	3.6E-02	-1.1
10444	2.9E-02	1.2E-01	2.4E-01	-0.6	7.6E-01	9.0E-02	3.1
10448	3.9E-02	1.6E-02	2.5E+00	0.4	7.6E-01	1.2E-02	-3.3
61-1091	4.3E-01	6.8E-01	6.3E-01	-0.2	7.6E-01	5.2E-01	1.2

Ni-63 in Waste

Sample Number	Isotope Conc.	Co-60 Key Iso. Conc.	Iso/Key Ratio	log Iso/Key	Average Sealing Factor	Calculated Iso. Conc.	Iso vs. Calc. Factor
10443	1.6E-04	4.8E-02	Eliminated	N.A.	4.0E-01	1.9E-02	120.5
10444	1.9E-04	1.2E-01	Eliminated	N.A.	4.0E-01	4.8E-02	252.6
10448	8.6E-03	1.6E-02	5.5E-01	-0.3	4.0E-01	6.3E-03	-1.4
61-1091	2.0E-01	6.8E-01	2.9E-01	-0.5	4.0E-01	2.7E-01	1.4

see attached explanation



Ni-63 in Liquid Waste-Modified Scaling Factor

Sample Number	Co-60				Average Scaling Factor	Calculated Iso. Conc.	Iso vs. Calo. Factor
	Isotope Conc.	Key Iso. Conc.	Iso/Key Ratio	log Iso/Key			
10443	1.6E-04	4.8E-02	3.3E-03	-2.5	3.1E-02	1.5E-03	9.1
10444	1.9E-04	1.2E-01	1.6E-03	-2.8	3.1E-02	3.6E-03	19.1
10448	8.6E-03	1.6E-02	5.5E-01	-0.3	3.1E-02	4.7E-04	-18.1
61-1091	2.0E-01	6.8E-01	2.9E-01	-0.5	3.1E-02	2.1E-02	-9.6

#### **Ni-63 in Liquid Waste**

The unmodified S.F. was  $3.1\text{E-}02$ ; however, this resulted in a nonconservative calculated isotopic concentration for sample 10448. Therefore, the S.F. was recalculated using the values of samples 10448 and 61-1091, resulting with a conservative factor of  $4.0\text{E-}01$ .

Pu-241 in Liquid Waste (Isotope : Ce-144)

Sample Number	Isotope Conc	Ce-144			Average Scaling Factor	Calculated Iso. Conc	Iso vs. Calo. Factor
		Key Iso. Conc	Iso/Key Ratio	log Iso/Key			
10443	4.1E-04	7.0E-04	5.9E-01	-0.2	7.7E-01	5.4E-04	1.3
10444	7.9E-04	2.9E-03	2.7E-01	-0.6	7.7E-01	2.2E-03	2.8
10448	1.6E-04	2.6E-04	6.2E-01	-0.2	7.7E-01	2.0E-04	1.2
61-1091	8.1E-03	2.3E-03	3.5E+00	0.5	7.7E-01	1.8E-03	-4.6

Pu-241 in Liquid Waste Isotope : Co-60)

Sample Number	Isotope Conc.	Co-60		log Iso/Key	Average Scaling Factor	Calculated Iso. Conc.	Iso vs. Calc. Factor
		Key Iso. Conc.	Iso/Key Ratio				
10443	4.1E-04	4.8E-02	8.6E-03	-2.1	9.2E-03	4.4E-04	1.1
10444	7.9E-04	1.2E-01	6.6E-03	-2.2	9.2E-03	1.1E-03	1.4
10448	1.6E-04	1.6E-02	1.0E-02	-2.0	9.2E-03	1.4E-04	-1.1
61-1091	8.1E-03	6.8E-01	1.2E-02	-1.9	9.2E-03	6.2E-03	-1.3

Cm-242 in Liquid Waste (Isotope : Ce-144)

Sample Number	Ce-144				Average Scaling Factor	Calculated Iso. Conc.	Iso vs. Calc. Factor
	Isotope Conc.	Key Iso. Conc.	Iso/Key Ratio	log Iso/Key			
10443	9.2E-06	7.0E-04	1.3E-02	-1.9	1.4E-02	9.5E-06	1.0
10444	3.6E-05	2.9E-03	1.2E-02	-1.9	1.4E-02	3.9E-05	1.1
10448	2.0E-06	2.6E-04	7.7E-03	-2.1	1.4E-02	3.5E-06	1.8
61-1091	6.2E-05	2.3E-03	2.7E-02	-1.6	1.4E-02	3.1E-05	-2.0

Sample Number	Isotope Conc.	Co-60			Average Scaling Factor	Calculated Iso. Conc.	Iso vs. Calc. Factor
		Key Iso. Conc.	Iso/Key Ratio	log Iso/Key			
10443	9.2E-06	4.8E-02	1.9E-04	-3.7	1.6E-04	7.7E-06	-1.2
10444	3.6E-05	1.2E-01	3.0E-04	-3.5	1.6E-04	1.9E-05	-1.9
10448	2.0E-06	1.6E-02	1.3E-04	-3.9	1.6E-04	2.5E-06	1.3
61-1091	6.2E-05	6.8E-01	9.1E-05	-4.0	1.6E-04	1.1E-04	1.8

Pu-238 in Liquid Waste (Isotope : Ce-144)

		Ce-144			Average Scaling	Calculated	Iso vs. Calc.
Sample Number	Isotope Conc.	Key Iso. Conc.	Iso/Key Ratio	log Iso/Key	Factor	Iso. Conc.	Factor
10443	2.9E-06	7.0E-04	4.1E-03	-2.4	7.1E-03	5.0E-06	1.7
10444	8.8E-06	2.9E-03	3.0E-03	-2.5	7.1E-03	2.1E-05	2.3
10448	7.6E-07	2.6E-04	2.9E-03	-2.5	7.1E-03	1.8E-06	2.4
61-1091	1.6E-04	2.3E-03	7.0E-02	-1.2	7.1E-03	1.6E-05	-9.8

Pu-238 in Liquid Waste (Isotope : Co-60)

Sample Number	Isotope Conc.	Co-60			Average Scaling Factor	Calculated Iso. Conc.	Iso vs. Calc. Factor
		Key Iso. Conc.	Iso/Key Ratio	log Iso/Key			
10443	2.9E-06	4.8E-02	6.1E-05	-4.2	8.5E-05	4.1E-06	1.4
10444	8.8E-06	1.2E-01	7.4E-05	-4.1	8.5E-05	1.0E-05	1.1
10448	7.6E-07	1.6E-02	4.9E-05	-4.3	8.5E-05	1.3E-06	1.7
61-1091	1.6E-04	6.8E-01	2.4E-04	-3.6	8.5E-05	5.8E-05	-2.8



Am-241 in Liquid Was (Key Isotope : Ce-144)

Sample Number	Isotope Conc.	Ce-144			Average Scaling Factor	Calculated Iso. Conc.	Iso vs. Calc. Factor
		Key Iso. Conc.	Iso/Key Ratio	log Iso/Key			
10443	1.3E-06	7.0E-04	1.9E-03	-2.7	3.2E-03	2.2E-06	1.7
10444	4.4E-06	2.9E-03	1.5E-03	-2.8	3.2E-03	9.1E-06	2.1
10448	2.5E-07	2.6E-04	9.6E-04	-3.0	3.2E-03	8.2E-07	3.3
61-1091	8.4E-05	2.3E-03	3.7E-02	-1.4	3.2E-03	7.3E-06	-11.6

Since there is no influence from <LLD values, there is no obvious route to modify Scaling Factor

Am-241 in Liquid Waste (Key Isotope : Co-60)

Sample Number	Co-60				Average Scaling Factor	Calculated Iso. Conc.	Iso vs. Calo. Factor
	Isotope Conc.	Key Iso. Conc.	Iso/Key Ratio	log Iso/Key			
10443	1.3E-06	4.8E-02	2.7E-05	-4.6	3.8E-05	1.8E-06	1.4
10444	4.4E-06	1.2E-01	3.7E-05	-4.4	3.8E-05	4.5E-06	1.0
10448	2.5E-07	1.6E-02	1.6E-05	-4.8	3.8E-05	5.8E-07	2.3
61-1091	8.4E-05	6.8E-01	1.2E-04	-3.9	3.8E-05	2.6E-05	-3.3

Pu-239 (Pu-240) in Liquid (Key Isotope : Ce-144)

Sample Number	Isotope Conc.	Ce-144			Average Scaling		Calculated	Iso vs. Calc.
		Key Iso. Conc.	Iso/Key Ratio	log Iso/Key	Factor	Iso Conc.	Factor	
10443	2.0E-06	7.0E-04	2.9E-03	-2.5	5.9E-03	4.1E-06	2.1	
10444	6.8E-06	2.9E-03	2.4E-03	-2.6	5.9E-03	1.7E-05	2.5	
10448	2.1E-06	2.6E-04	8.1E-03	-2.1	5.9E-03	1.5E-06	-1.4	
61-1091	5.0E-05	2.3E-03	2.2E-02	-1.7	5.9E-03	1.3E-05	-3.7	

Pu-239 (Pu-240) in Liquid (Key Isotope : Co-60)

Sample Number	Isotope Conc.	Co-60			Average Scaling		Calculated	Iso vs. Calc.
		Key Iso. Conc.	Iso/Key Ratio	log Iso/Key	Factor	Iso. Conc.	Factor	
10443	2.0E-06	4.8E-02	4.2E-05	-4.4	7.0E-05	3.3E-06	1.7	
10444	6.8E-06	1.2E-01	5.7E-05	-4.2	7.0E-05	8.3E-06	1.2	
10448	2.1E-06	1.6E-02	1.4E-04	-3.9	7.0E-05	1.1E-06	-1.9	
61-1091	5.0E-05	6.8E-01	7.4E-05	-4.1	7.0E-05	4.8E-05	-1.1	

Pu-242 (Np-237) in Liquid Waste (Key Isotope : Ce-144)

Sample Number	Isotope Conc.	Ce-144			Average Scaling Factor	Calculated Iso. Conc.	Iso vs. Calc. Factor
		Key Iso. Conc.	Iso/Key Ratio	log Iso/Key			
10443	1.2E-07	7.0E-04	1.7E-04	-3.8	4.6E-04	3.2E-07	2.7
10444	1.1E-07	2.9E-03	3.8E-05	-4.4	4.6E-04	1.3E-06	12.1
10448	2.9E-07	2.6E-04	1.1E-03	-3.0	4.6E-04	1.2E-07	-2.4
61-1091	1.4E-05	2.3E-03	6.1E-03	-2.2	4.6E-04	1.1E-06	-13.3

Elimination of <LLD values for samples 10448 and 61-1091 would result in a less conservative Scaling Factor

Pu-242 (Np-237) in Liquid (Key Isotope : Co-60)

Sample Number	Isotope Conc.	Co-60		log Iso/Key	Average Scaling		Iso vs. Calc.
		Key Iso. Conc.	Iso/Key Ratio		Factor	Calculated Iso. Conc.	
10443	1.2E-07	4.8E-02	2.5E-06	-5.6	5.5E-06	2.6E-07	2.2
10444	1.1E-07	1.2E-01	9.2E-07	-6.0	5.5E-06	6.5E-07	5.9
10448	< 2.9E-07	1.6E-02	1.9E-05	-4.7	5.5E-06	8.5E-08	-3.4
61-1091	< 1.4E-05	6.8E-01	2.1E-05	-4.7	5.5E-06	3.7E-06	-3.8

Cm-243 (Cm-244) in Liquid % (Key Isotope : Ce-144)

Sample Number	Isotope Conc.	Ce-144		log Iso/Key	Average Scaling	Calculated	Iso vs. Calc.
		Key Iso. Conc.	Iso/Key Ratio		Factor	Iso. Conc.	Factor
10443	1.5E-06	7.0E-04	2.1E-03	-2.7	3.9E-03	2.7E-06	1.8
10444	3.9E-06	2.9E-03	1.3E-03	-2.9	3.9E-03	1.1E-05	2.9
10448	7.6E-07	2.6E-04	2.9E-03	-2.5	3.9E-03	1.0E-06	1.3
61-1091	6.0E-05	2.3E-03	2.6E-02	-1.6	3.9E-03	8.9E-06	-6.8

Cm-243 (Cm-244) in Liquid (Key Isotope : Co-60)

Sample Number	Isotope Conc.	Co-60		log Iso/Key	Average Scaling	Calculated	Iso vs. Calc.
		Key Iso. Conc.	Iso/Key Ratio		Factor	Iso. Conc.	Factor
10443	1.5E-06	4.8E-02	3.1E-05	-4.5	4.6E-05	2.2E-06	1.5
10444	3.9E-06	1.2E-01	3.3E-05	-4.5	4.6E-05	5.5E-06	1.4
10448	7.6E-07	1.6E-02	4.9E-05	-4.3	4.6E-05	7.1E-07	-1.1
61-1091	6.0E-05	6.8E-01	8.8E-05	-4.1	4.6E-05	3.1E-05	-1.9





## Primary Filter Scaling Factor Evaluation

Sample Number	Cs-137				Average Soaling Factor	Calculated Iso. Conc.	Iso vs. Calc. Factor
	Isotope Conc.	Key Iso. Conc.	Iso/Key Ratio	log Iso/Key			
10391	< 1.7E-02	< 1.3E+00	1.3E-02	-1.9	4.0E-02	5.2E-02	3.1
10392	1.7E-01	< 1.1E+00	1.6E-01	-0.8	4.0E-02	4.4E-02	-3.9
10393	3.1E-02	< 1.8E+00	1.7E-02	-1.8	4.0E-02	7.2E-02	2.3
10394	1.0E-03	< 4.3E-02	2.3E-02	-1.6	4.0E-02	1.7E-03	1.7
10395	1.2E-02	< 2.2E-01	5.4E-02	-1.3	4.0E-02	8.7E-03	-1.3
10396	3.4E-03	< 1.4E-01	2.4E-02	-1.6	4.0E-02	5.6E-03	1.7
61-1089	6.3E-02	3.2E+00	2.0E-02	-1.7	4.0E-02	1.3E-01	2.0
61-1090	4.0E-02	9.3E-01	4.3E-02	-1.4	4.0E-02	3.7E-02	-1.1
61-1092	6.6E-03	2.2E-02	3.0E-01	-0.5	4.0E-02	8.8E-04	-7.5

Sample Number	Isotope Conc.	Cs-137		log Iso/Key	Average Scaling Factor	Calculated Iso. Conc.	Iso vs. Calc. Factor
		Key Iso. Conc.	Iso/Key Ratio				
10391	< 5.3E-03	< 1.3E+00	Eliminated	N.A.	1.8E+00	2.4E+00	446.8
10392	< 8.4E-03	< 1.1E+00	Eliminated	N.A.	1.8E+00	2.0E+00	238.5
10393	< 9.6E-03	< 1.8E+00	Eliminated	N.A.	1.8E+00	3.3E+00	341.5
10394	< 1.9E-04	< 4.3E-02	Eliminated	N.A.	1.8E+00	7.8E-02	412.2
10395	< 6.3E-04	< 2.2E-01	Eliminated	N.A.	1.8E+00	3.9E-01	624.2
10396	< 1.1E-03	< 1.4E-01	Eliminated	N.A.	1.8E+00	2.5E-01	231.8
61-1089	2.3E+01	3.2E+00	7.2E+00	0.9	1.8E+00	5.8E+00	-3.9
61-1090	8.6E-01	9.3E-01	9.2E-01	0.0	1.8E+00	1.7E+00	2.0
61-1092	2.0E-02	2.2E-02	9.1E-01	0.0	1.8E+00	4.0E-02	2.0

See attached explanation

Tc-99 in Primary Filter Modified Scaling Factor

Sample Number	Isotope Conc	Cs-137		log Iso/Key	Average Scaling Factor	Calculated Iso. Conc	Iso vs. Calc. Factor
		Key Iso. Conc	Iso/Key Ratio				
10391	< 5.3E-03	< 1.3E+00	4.1E-03	-2.4	3.6E-02	4.7E-02	8.8
10392	< 8.4E-03	< 1.1E+00	7.6E-03	-2.1	3.6E-02	4.0E-02	4.7
10393	< 9.6E-03	< 1.8E+00	5.3E-03	-2.3	3.6E-02	6.5E-02	6.8
10394	< 1.9E-04	< 4.3E-02	4.4E-03	-2.4	3.6E-02	1.5E-03	8.1
10395	< 6.3E-04	< 2.2E-01	2.9E-03	-2.5	3.6E-02	7.8E-03	12.3
10396	< 1.1E-03	< 1.4E-01	7.9E-03	-2.1	3.6E-02	5.0E-03	4.6
61-1089	2.3E+01	3.2E+00	7.2E+00	0.9	3.6E-02	1.2E-01	-199.6
61-1090	8.6E-01	9.3E-01	9.2E-01	0.0	3.6E-02	3.3E-02	-25.7
61-1092	2.0E-02	2.2E-02	9.1E-01	0.0	3.6E-02	7.9E-04	-25.3

#### **Tc-99 in Primary Filter**

The unmodified S.F. was  $3.6\text{E-}02$ ; however, this resulted in a nonconservative calculated isotopic concentration for samples 61-1089, 61-1090, and 61-1092; none of which contained  $\leq$ LLD values. Therefore, the S.F. was recalculated using only the positive values of samples 61-1089, 61-1090, and 61-1092, resulting with a conservative factor of  $1.8\text{E}+00$ .

Sample Number	Isotope Conc.	Cs-137			Average Scaling Factor	Calculated Iso. Conc.	Iso vs. Calc. Factor
		Key Iso. Conc.	Iso/Key Ratio	log Iso/Key			
10391	< 2.4E-02	< 1.3E+00	1.8E-02	-1.7	1.0E-03	1.3E-03	-17.9
10392	< 1.6E-02	< 1.1E+00	1.5E-02	-1.8	1.0E-03	1.1E-03	-14.1
10393	< 2.2E-03	< 1.8E+00	1.2E-03	-2.9	1.0E-03	1.9E-03	-1.2
10394	< 1.9E-04	< 4.3E-02	4.4E-03	-2.4	1.0E-03	4.4E-05	-4.3
10395	< 1.4E-04	< 2.2E-01	6.5E-04	-3.2	1.0E-03	2.2E-04	1.6
10396	< 1.4E-04	< 1.4E-01	1.0E-03	-3.0	1.0E-03	1.4E-04	1.0
61-1089	< 7.5E-05	3.2E+00	2.3E-05	-4.6	1.0E-03	3.3E-03	43.9
61-1090	< 5.5E-05	9.3E-01	5.9E-05	-4.2	1.0E-03	9.6E-04	17.4
61-1092	< 2.2E-05	2.2E-02	1.0E-03	-3.0	1.0E-03	2.3E-05	1.0

Due to <LLD values exhibited in samples, no other satisfactory Scaling Factors can be determined

Sample Number	Isotope Conc.	Co-60		log Iso/Key	Average Scaling Factor	Calculated Iso. Conc.	Iso vs. Calo. Factor
		Key Iso. Conc.	Iso/Key Ratio				
10391	6.0E-01	5.9E+02	Eliminated	N.A.	2.8E-02	1.7E+01	27.6
10392	3.5E-01	5.2E+02	Eliminated	N.A.	2.8E-02	1.5E+01	42.1
10393	3.3E+00	2.5E+03	Eliminated	N.A.	2.8E-02	7.0E+01	21.4
10394	6.9E-02	2.4E+01	Eliminated	N.A.	2.8E-02	6.9E-01	10.0
10395	7.3E-01	2.9E+02	Eliminated	N.A.	2.8E-02	8.2E+00	11.3
10396	4.4E-02	1.1E+02	Eliminated	N.A.	2.8E-02	3.1E+00	70.3
61-1089	2.1E+01	4.1E+02	5.1E-02	-1.3	2.8E-02	1.2E+01	-1.8
61-1090	4.0E+00	2.3E+02	1.7E-02	-1.8	2.8E-02	6.5E+00	1.6
61-1092	1.4E+00	5.5E+01	2.5E-02	-1.6	2.8E-02	1.6E+00	1.1

## C-14 in Primary Filter Modified Scaling Factor

Sample Number	Isotope Conc.	Co-60			Average Scaling Factor	Calculated Iso. Conc.	Iso vs. Calc. Factor
		Key Iso. Conc.	Iso/Key Ratio	log Iso/Key			
10391	6.0E-01	5.9E+02	1.0E-03	-3.0	3.4E-03	2.0E+00	3.3
10392	3.5E-01	5.2E+02	6.7E-04	-3.2	3.4E-03	1.8E+00	5.0
10393	3.3E+00	2.5E+03	1.3E-03	-2.9	3.4E-03	8.4E+00	2.6
10394	6.9E-02	2.4E+01	2.8E-03	-2.5	3.4E-03	8.2E-02	1.2
10395	7.3E-01	2.9E+02	2.5E-03	-2.6	3.4E-03	9.9E-01	1.4
10396	4.4E-02	1.1E+02	4.0E-04	-3.4	3.4E-03	3.7E-01	8.4
61-1089	2.1E+01	4.1E+02	5.1E-02	-1.3	3.4E-03	1.4E+00	-15.1
61-1090	4.0E+00	2.3E+02	1.7E-02	-1.8	3.4E-03	7.8E-01	-5.1
61-1092	1.4E+00	5.5E+01	2.5E-02	-1.6	3.4E-03	1.9E-01	-7.5



#### C-14 in Primary Filter

The unmodified S.F. was  $3.4\text{E-}03$ ; however, this resulted in a nonconservative calculated isotopic concentration for samples 61-1089, 61-1090, and 61-1092, of which 61-1089 was the only nonconservative out of spec. result. Therefore, the S.F. was recalculated using the values of samples 61-1089, 61-1090, and 61-1092, resulting with a conservative factor of  $2.8\text{E-}02$ .

Sample Number	Isotope Conc	Co-60		log Iso/Key	Average Scaling Factor	Calculated Iso. Conc	Iso vs. Calc. Factor
		Key Iso. Conc	Iso/Key Ratio				
10391	1.5E+01	5.9E+02	2.6E-02	-1.6	3.1E-01	1.8E+02	11.9
10392	5.5E+02	5.2E+02	1.1E+00	0.0	3.1E-01	1.6E+02	-3.4
10393	1.9E+03	2.5E+03	7.5E-01	-0.1	3.1E-01	7.6E+02	-2.4
10394	2.2E+01	2.4E+01	9.0E-01	0.0	3.1E-01	7.4E+00	-2.9
10395	2.7E+01	2.9E+02	9.1E-02	-1.0	3.1E-01	8.9E+01	3.4
10396	2.3E+02	1.1E+02	2.1E+00	0.3	3.1E-01	3.3E+01	-6.7
61-1089	1.3E+02	4.1E+02	3.2E-01	-0.5	3.1E-01	1.3E+02	-1.0
61-1090	6.2E+01	2.3E+02	2.7E-01	-0.6	3.1E-01	7.1E+01	1.1
61-1092	4.5E+00	5.5E+01	8.2E-02	-1.1	3.1E-01	1.7E+01	3.7

No out of spec. nonconservative correlations are observed

Ni-63 in Printing Filter

Sample Number	Co-60				Average Scaling Factor	Calculated Iso. Conc.	Iso vs. Calc. Factor
	Isotope Conc.	Key Iso. Conc.	Iso/Key Ratio	log Iso/Key			
10391	4.9E+01	5.9E+02	8.3E-02	-1.1	1.8E-01	1.1E+02	2.2
10392	2.1E+02	5.2E+02	4.1E-01	-0.4	1.8E-01	9.6E+01	-2.2
10393	4.7E+02	2.5E+03	1.9E-01	-0.7	1.8E-01	4.6E+02	-1.0
10394	5.7E+00	2.4E+01	2.3E-01	-0.6	1.8E-01	4.5E+00	-1.3
10395	2.5E+01	2.9E+02	8.6E-02	-1.1	1.8E-01	5.4E+01	2.1
10396	2.2E+01	1.1E+02	2.0E-01	-0.7	1.8E-01	2.0E+01	-1.1
61-1089	1.4E+02	4.1E+02	3.4E-01	-0.5	1.8E-01	7.5E+01	-1.9
61-1090	4.5E+01	2.3E+02	2.0E-01	-0.7	1.8E-01	4.2E+01	-1.1
61-1092	7.5E+00	5.5E+01	1.4E-01	-0.9	1.8E-01	1.0E+01	1.4

Pu-241 in Primary Filter (Key Isotope : Ce-144)

Sample Number	Isotope Conc.	Ce-144			Average Scaling Factor	Calculated Iso. Conc.	Iso vs. Calc. Factor
		Key Iso. Conc.	Iso/Key Ratio	log Iso/Key			
10391	1.6E-01	3.8E+00	4.2E-02	-1.4	3.4E-01	1.3E+00	8.0
10392	5.3E+00	2.0E+01	2.7E-01	-0.6	3.4E-01	6.6E+00	1.2
10393	2.0E+00	4.3E+00	4.6E-01	-0.3	3.4E-01	1.4E+00	-1.4
10394	8.4E-02	6.8E-02	1.2E+00	0.1	3.4E-01	2.3E-02	-3.7
10395	1.1E-01	3.3E-01	3.4E-01	-0.5	3.4E-01	1.1E-01	-1.0
10396	2.4E-01	1.5E+00	1.6E-01	-0.8	3.4E-01	5.1E-01	2.2
61-1089	3.3E+00	4.9E+00	6.7E-01	-0.2	3.4E-01	1.6E+00	-2.0
61-1090	9.9E-01	1.7E+00	5.8E-01	-0.2	3.4E-01	5.7E-01	-1.7
61-1092	2.1E-01	5.2E-01	4.0E-01	-0.4	3.4E-01	1.7E-01	-1.2

Pu-241 in Primary Filter Isotope : Co-60)

Sample Number	Isotope Conc.	Co-60			Average Scaling Factor	Calculated Iso. Conc.	Iso vs. Calc. Factor
		Key Iso. Conc.	Iso/Key Ratio	log Iso/Key			
10391	1.6E-01	5.9E+02	2.7E-04	-3.6	2.1E-03	1.2E+00	7.8
10392	5.3E+00	5.2E+02	1.0E-02	-2.0	2.1E-03	1.1E+00	-4.8
10393	2.0E+00	2.5E+03	8.0E-04	-3.1	2.1E-03	5.3E+00	2.6
10394	8.4E-02	2.4E+01	3.5E-03	-2.5	2.1E-03	5.2E-02	-1.6
10395	1.1E-01	2.9E+02	3.9E-04	-3.4	2.1E-03	6.2E-01	5.4
10396	2.4E-01	1.1E+02	2.2E-03	-2.7	2.1E-03	2.3E-01	-1.0
61-1089	3.3E+00	4.1E+02	9.0E-03	-2.1	2.1E-03	8.7E-01	-3.8
61-1090	9.9E-01	2.3E+02	4.3E-03	-2.4	2.1E-03	4.9E-01	-2.0
61-1092	2.1E-01	5.5E+01	3.8E-03	-2.4	2.1E-03	1.2E-01	-1.8

Cm-242 in Primary Filter (Key Isotope : Ce-144)

Sample Number	Isotope Conc	Ce-144			Average Scaling Factor	Calculated Iso. Conc	Iso vs. Calc. Factor
		Key Iso. Conc	Iso/Key Ratio	log Iso/Key			
10391	4.0E-03	< 3.8E+00	1.1E-03	-3.0	2.5E-03	9.5E-03	2.4
10392	6.5E-02	2.0E+01	3.3E-03	-2.5	2.5E-03	4.9E-02	-1.3
10393	5.2E-03	< 4.3E+00	1.2E-03	-2.9	2.5E-03	1.1E-02	2.1
10394	3.6E-04	6.8E-02	5.3E-03	-2.3	2.5E-03	1.7E-04	-2.1
10395	4.9E-03	3.3E-01	1.5E-02	-1.8	2.5E-03	8.3E-04	-5.8
10396	1.6E-03	1.5E+00	1.1E-03	-3.0	2.5E-03	3.8E-03	2.3
61-1089	1.2E-02	4.9E+00	2.4E-03	-2.6	2.5E-03	1.2E-02	1.0
61-1090	7.1E-03	1.7E+00	4.2E-03	-2.4	2.5E-03	4.2E-03	-1.7
61-1092	5.6E-04	5.2E-01	1.1E-03	-3.0	2.5E-03	1.3E-03	2.3

Cm-242 in Primary Filter (Key Isotope : Co-60)

Sample Number	Isotope Conc.	Co-60			Average Scaling Factor	Calculated Iso. Conc.	Iso vs. Calo. Factor
		Key Iso. Conc.	Iso/Key Ratio	log Iso/Key			
10391	4.0E-03	5.9E+02	6.8E-06	-5.2	1.6E-05	9.3E-03	2.3
10392	6.5E-02	5.2E+02	1.2E-04	-3.9	1.6E-05	8.2E-03	-7.9
10393	5.2E-03	2.5E+03	2.1E-06	-5.7	1.6E-05	3.9E-02	7.5
10394	3.6E-04	2.4E+01	1.5E-05	-4.8	1.6E-05	3.8E-04	1.1
10395	4.9E-03	2.9E+02	1.7E-05	-4.8	1.6E-05	4.6E-03	-1.1
10396	1.6E-03	1.1E+02	1.5E-05	-4.8	1.6E-05	1.7E-03	1.1
61-1089	1.2E-02	4.1E+02	2.9E-05	-4.5	1.6E-05	6.5E-03	-1.9
61-1090	7.1E-03	2.3E+02	3.1E-05	-4.5	1.6E-05	3.6E-03	-2.0
61-1092	5.6E-04	5.5E+01	1.0E-05	-5.0	1.6E-05	8.7E-04	1.5

Pu-238 in Primary Filter (Key Isotope : Ce-144)

Sample Number	Isotope Conc.	Ce-144			Average Scaling Factor	Calculated Iso. Conc.	Iso vs. Calc. Factor
		Key Iso. Conc.	Iso/Key Ratio	log Iso/Key			
10391	1.1E-03	3.8E+00	2.9E-04	-3.5	2.6E-03	1.0E-02	9.1
10392	5.9E-02	2.0E+01	3.0E-03	-2.5	2.6E-03	5.2E-02	-1.2
10393	7.4E-03	4.3E+00	1.7E-03	-2.8	2.6E-03	1.1E-02	1.5
10394	6.4E-04	6.8E-02	9.4E-03	-2.0	2.6E-03	1.8E-04	-3.6
10395	1.5E-03	3.3E-01	4.5E-03	-2.3	2.6E-03	8.8E-04	-1.7
10396	2.2E-03	1.5E+00	1.4E-03	-2.8	2.6E-03	4.0E-03	1.8
61-1089	1.4E-02	4.9E+00	2.9E-03	-2.5	2.6E-03	1.3E-02	-1.1
61-1090	9.2E-03	1.7E+00	5.4E-03	-2.3	2.6E-03	4.5E-03	-2.1
61-1092	2.2E-03	5.2E-01	4.2E-03	-2.4	2.6E-03	1.4E-03	-1.6



Pu-238 in Primary Filter (Key Isotope : Co-60)

Sample Number	Isotope Conc.	Co-60		log Iso/Key	Average Scaling Factor	Calculated Iso. Conc.	Iso vs. Calc. Factor
		Key Iso. Conc.	Iso/Key Ratio				
10391	1.1E-03	5.9E+02	1.9E-06	-5.7	1.7E-05	9.8E-03	8.9
10392	5.9E-02	5.2E+02	1.1E-04	-3.9	1.7E-05	8.6E-03	-6.9
10393	7.4E-03	2.5E+03	3.0E-06	-5.5	1.7E-05	4.1E-02	5.6
10394	6.4E-04	2.4E+01	2.6E-05	-4.6	1.7E-05	4.0E-04	-1.6
10395	1.5E-03	2.9E+02	5.2E-06	-5.3	1.7E-05	4.8E-03	3.2
10396	2.2E-03	1.1E+02	2.0E-05	-4.7	1.7E-05	1.8E-03	-1.2
61-1089	1.4E-02	4.1E+02	3.4E-05	-4.5	1.7E-05	6.8E-03	-2.1
61-1090	9.2E-03	2.3E+02	4.0E-05	-4.4	1.7E-05	3.8E-03	-2.4
61-1092	2.2E-03	5.5E+01	4.0E-05	-4.4	1.7E-05	9.1E-04	-2.4

Am-241 in Primary Filter (Key Isotope : Ce-144)

Sample Number	Isotope Conc.	Ce-144		log Iso/Key	Average Soaling Factor	Calculated Iso. Conc.	Iso vs. Calc. Factor
		Key Iso. Conc.	Iso/Key Ratio				
10391	7.8E-04	< 3.8E+00	2.1E-04	-3.7	1.1E-03	4.3E-03	5.6
10392	6.7E-02	2.0E+01	3.4E-03	-2.5	1.1E-03	2.2E-02	-3.0
10393	4.0E-03	< 4.3E+00	9.2E-04	-3.0	1.1E-03	4.9E-03	1.2
10394	3.3E-04	6.9E-02	4.9E-03	-2.3	1.1E-03	7.8E-05	-4.3
10395	3.3E-04	3.3E-01	9.9E-04	-3.0	1.1E-03	3.8E-04	1.2
10396	2.5E-04	1.5E+00	1.6E-04	-3.8	1.1E-03	1.7E-03	6.9
61-1089	6.8E-03	4.9E+00	1.4E-03	-2.9	1.1E-03	5.6E-03	-1.2
61-1090	6.6E-03	1.7E+00	3.9E-03	-2.4	1.1E-03	1.9E-03	-3.4
61-1092	6.2E-04	5.2E-01	1.2E-03	-2.9	1.1E-03	5.9E-04	-1.0

Sample Number	Isotope Conc.	Co-60		log Iso/Key	Average Scaling Factor	Calculated Iso. Conc.	Iso vs. Calc. Factor
		Key Iso. Conc.	Iso/Key Ratio				
10391	7.8E-04	5.9E+02	1.3E-06	-5.9	7.2E-06	4.2E-03	5.4
10392	6.7E-02	5.2E+02	1.3E-04	-3.9	7.2E-06	3.7E-03	-17.9
10393	4.0E-03	2.5E+03	1.6E-06	-5.8	7.2E-06	1.8E-02	4.5
10394	3.3E-04	2.4E+01	1.4E-05	-4.9	7.2E-06	1.7E-04	-1.9
10395	3.3E-04	2.9E+02	1.1E-06	-5.9	7.2E-06	2.1E-03	6.3
10396	2.5E-04	1.1E+02	2.3E-06	-5.6	7.2E-06	7.8E-04	3.1
61-1089	6.8E-03	4.1E+02	1.7E-05	-4.8	7.2E-06	2.9E-03	-2.3
61-1090	6.6E-03	2.3E+02	2.9E-05	-4.5	7.2E-06	1.7E-03	-4.0
61-1092	6.2E-04	5.5E+01	1.1E-05	-4.9	7.2E-06	4.0E-04	-1.6

Since there is no influence of <LLD values, there is no obvious route to modify Scaling Factor

Sample Number	Isotope Conc.	Ce-144			Average Scaling		Calculated	Iso vs. Calc.
		Key Iso. Conc.	Iso/Key Ratio	log Iso/Key	Factor	Iso. Conc.	Factor	
10391	4.5E-04	< 3.8E+00	1.2E-04	-3.9	1.9E-03	7.2E-03	16.1	
10392	4.7E-02	2.0E+01	2.4E-03	-2.6	1.9E-03	3.7E-02	-1.3	
10393	6.7E-03	< 4.3E+00	1.6E-03	-2.8	1.9E-03	8.2E-03	1.2	
10394	5.8E-04	6.8E-02	8.5E-03	-2.1	1.9E-03	1.3E-04	-4.5	
10395	6.9E-04	3.3E-01	2.1E-03	-2.7	1.9E-03	6.3E-04	-1.1	
10396	1.9E-03	1.5E+00	1.2E-03	-2.9	1.9E-03	2.9E-03	1.5	
61-1089	1.1E-02	4.9E+00	2.2E-03	-2.6	1.9E-03	9.3E-03	-1.2	
61-1090	7.9E-03	1.7E+00	4.6E-03	-2.3	1.9E-03	3.2E-03	-2.4	
61-1092	1.7E-03	5.2E-01	3.3E-03	-2.5	1.9E-03	9.9E-04	-1.7	

Elimination of <LLD values would result in a less conservative Scaling Factor and no out of spec. nonconservative correlation values are observed

Pu-239 (Pu-240) in Primary Filter (Key Isotope : Co-60)

Sample Number	Isotope Conc.	Co-60			Average Scaling		Calculated	
		Key Iso. Conc.	Iso/Key Ratio	log Iso/Key	Factor	Iso. Conc.	Iso vs. Calc.	Factor
10391	4.5E-04	5.9E+02	7.7E-07	-6.1	1.2E-05	7.1E-03	15.7	
10392	4.7E-02	5.2E+02	9.0E-05	-4.0	1.2E-05	6.3E-03	-7.5	
10393	6.7E-03	2.5E+03	2.7E-06	-5.6	1.2E-05	3.0E-02	4.4	
10394	5.8E-04	2.4E+01	2.4E-05	-4.6	1.2E-05	2.9E-04	-2.0	
10395	6.9E-04	2.9E+02	2.4E-06	-5.6	1.2E-05	3.5E-03	5.0	
10396	1.9E-03	1.1E+02	1.7E-05	-4.8	1.2E-05	1.3E-03	-1.4	
61-1089	1.1E-02	4.1E+02	2.7E-05	-4.6	1.2E-05	4.9E-03	-2.2	
61-1090	7.9E-03	2.3E+02	3.4E-05	-4.5	1.2E-05	2.8E-03	-2.9	
61-1092	1.7E-03	5.5E+01	3.1E-05	-4.5	1.2E-05	6.6E-04	-2.6	

No out of spec. nonconservative correlations are observed

Pu-242 (Np-237) in Primary Cooler (Key Isotope : Ce-144)

Sample Number	Isotope Conc.	Ce-144		log Iso/Key	Average Scaling Factor	Calculated Iso. Conc.	Iso vs. Calc. Factor
		Key Iso. Conc.	Iso/Key Ratio				
10391	2.4E-04	3.8E+00	6.3E-05	-4.2	3.7E-05	1.4E-04	-1.7
10392	2.8E-03	2.0E+01	1.4E-04	-3.8	3.7E-05	7.2E-04	-3.9
10393	7.6E-05	4.3E+00	1.8E-05	-4.8	3.7E-05	1.6E-04	2.1
10394	1.0E-05	6.8E-02	1.5E-04	-3.8	3.7E-05	2.5E-06	-4.0
10395	9.8E-06	3.3E-01	2.9E-05	-4.5	3.7E-05	1.2E-05	1.3
10396	4.8E-06	1.5E+00	3.2E-06	-5.5	3.7E-05	5.6E-05	11.7
61-1089	8.7E-05	4.9E+00	1.8E-05	-4.8	3.7E-05	1.8E-04	2.1
61-1090	3.1E-04	1.7E+00	1.8E-04	-3.7	3.7E-05	6.3E-05	-4.9
61-1092	9.4E-06	5.2E-01	1.8E-05	-4.7	3.7E-05	1.9E-05	2.0

No out of spec. nonconservative correlations are observed

		Co-60			Average Scaling	Calculated	Iso vs. Calc.
Sample Number	Isotope Conc.	Key Iso. Conc.	Iso/Key Ratio	log Iso/Key	Factor	Iso. Conc.	Factor
10391	< 2.4E-04	5.9E+02	4.1E-07	-6.4	2.3E-07	1.4E-04	-1.8
10392	2.8E-03	5.2E+02	5.4E-06	-5.3	2.3E-07	1.2E-04	-23.1
10393	7.6E-05	2.5E+03	3.1E-08	-7.5	2.3E-07	5.8E-04	7.6
10394	< 1.0E-05	2.4E+01	4.1E-07	-6.4	2.3E-07	5.7E-06	-1.8
10395	9.8E-06	2.9E+02	3.4E-08	-7.5	2.3E-07	6.8E-05	6.9
10396	4.8E-06	1.1E+02	4.4E-08	-7.4	2.3E-07	2.5E-05	5.3
61-1089	< 8.7E-05	4.1E+02	2.1E-07	-6.7	2.3E-07	9.5E-05	1.1
61-1090	< 3.1E-04	2.3E+02	1.3E-06	-5.9	2.3E-07	5.4E-05	-5.8
61-1092	< 9.4E-06	5.5E+01	1.7E-07	-6.8	2.3E-07	1.3E-05	1.4

There is no obvious route to modify Scaling Factor to eliminate the out of spec. nonconservative correlation

Cm-243 (Cm-244) in Primary (Key Isotope : Ce-144)

Sample Number	Isotope Conc.	Ce-144		log Iso/Key	Average Scaling Factor	Calculated Iso. Conc.	Iso vs. Calo. Factor
		Key Iso. Conc.	Iso/Key Ratio				
10391	3.9E-04	3.8E+00	1.0E-04	-4.0	9.0E-04	3.4E-03	8.8
10392	1.9E-02	2.0E+01	9.7E-04	-3.0	9.0E-04	1.8E-02	-1.1
10393	5.0E-03	4.3E+00	1.2E-03	-2.9	9.0E-04	3.9E-03	-1.3
10394	1.8E-04	6.8E-02	2.6E-03	-2.6	9.0E-04	6.1E-05	-2.9
10395	5.7E-04	3.3E-01	1.7E-03	-2.8	9.0E-04	3.0E-04	-1.9
10396	2.3E-04	1.5E+00	1.5E-04	-3.8	9.0E-04	1.4E-03	6.1
61-1089	6.9E-03	4.9E+00	1.4E-03	-2.9	9.0E-04	4.4E-03	-1.6
61-1090	6.4E-03	1.7E+00	3.8E-03	-2.4	9.0E-04	1.5E-03	-4.2
61-1092	4.9E-04	5.2E-01	9.4E-04	-3.0	9.0E-04	4.7E-04	-1.0



Cm-243 (Cm-244) in Primary (Key Isotope : Co-60)

Sample Number	Isotope Conc.	Co-60		log Iso/Key	Average Scaling Factor	Calculated Iso. Conc.	Iso vs. Calc. Factor
		Key Iso. Conc.	Iso/Key Ratio				
10391	3.9E-04	5.9E+02	6.6E-07	-6.2	5.7E-06	3.3E-03	8.6
10392	1.9E-02	5.2E+02	3.6E-05	-4.4	5.7E-06	3.0E-03	-6.4
10393	5.0E-03	2.5E+03	2.0E-06	-5.7	5.7E-06	1.4E-02	2.8
10394	1.8E-04	2.4E+01	7.4E-06	-5.1	5.7E-06	1.4E-04	-1.3
10395	5.7E-04	2.9E+02	2.0E-06	-5.7	5.7E-06	1.7E-03	2.9
10396	2.3E-04	1.1E+02	2.1E-06	-5.7	5.7E-06	6.2E-04	2.8
61-1089	6.9E-03	4.1E+02	1.7E-05	-4.8	5.7E-06	2.3E-03	-3.0
61-1090	6.4E-03	2.3E+02	2.8E-05	-4.6	5.7E-06	1.3E-03	-4.9
61-1092	4.9E-04	5.5E+01	8.9E-06	-5.1	5.7E-06	3.1E-04	-1.6

**Primary Resin Scaling Factor Evaluation**

Sample Number	Isotope Conc.	Cs-137			Average Scaling Factor	Calculated Iso. Conc.	Iso vs. Calc. Factor
		Key Iso. Conc.	Iso/Key Ratio	log Iso/Key			
10445	3.6E-02	1.8E+01	2.0E-03	-2.7	4.9E-03	8.6E-02	2.4
10446	3.8E-01	1.1E+02	3.5E-03	-2.5	4.9E-03	5.3E-01	1.4
10447	2.6E-01	2.7E+01	9.7E-03	-2.0	4.9E-03	1.3E-01	-2.0
10556	2.4E-03	1.3E+01	1.8E-04	-3.7	4.9E-03	6.5E-02	27.1
61-1087	3.3E-01	8.0E+00	4.1E-02	-1.4	4.9E-03	3.9E-02	-8.5
61-1088	4.0E-02	1.5E+00	2.7E-02	-1.6	4.9E-03	7.3E-03	-5.5

No out of spec. nonconservative correlations are observed

Sample Number	Isotope Conc.	Cs-137		log Iso/Key	Average Scaling Factor	Calculated Iso. Conc.	Iso vs. Calc. Factor
		Key Iso. Conc.	Iso/Key Ratio				
10445	< 5.7E-04	1.8E+01	Eliminated	N.A.	5.9E-03	1.0E-01	182.8
10446	< 1.4E-03	1.1E+02	Eliminated	N.A.	5.9E-03	6.4E-01	458.4
10447	< 1.7E-03	2.7E+01	Eliminated	N.A.	5.9E-03	1.6E-01	93.9
10556	< 1.6E-04	1.3E+01	Eliminated	N.A.	5.9E-03	7.9E-02	493.1
61-1087	2.6E-02	8.0E+00	3.3E-03	-2.5	5.9E-03	4.7E-02	1.8
61-1088	1.6E-02	1.5E+00	1.1E-02	-2.0	5.9E-03	8.8E-03	-1.8

Tc-99 in Primary Resin Modified Sealing Factor

Sample Number	Isotope Conc.	Cs-137			Average Sealing Factor	Calculated Iso. Conc.	Iso vs. Calc. Factor
		Key Iso. Conc.	Iso/Key Ratio	log Iso/Key			
10445	< 5.7E-04	1.8E+01	3.2E-05	-4.5	1.5E-04	2.6E-03	4.6
10446	< 1.4E-03	1.1E+02	1.3E-05	-4.9	1.5E-04	1.6E-02	11.6
10447	< 1.7E-03	2.7E+01	6.3E-05	-4.2	1.5E-04	4.0E-03	2.4
10556	< 1.6E-04	1.3E+01	1.2E-05	-4.9	1.5E-04	2.0E-03	12.4
61-1087	2.6E-02	8.0E+00	3.3E-03	-2.5	1.5E-04	1.2E-03	-21.9
61-1088	1.6E-02	1.5E+00	1.1E-02	-2.0	1.5E-04	2.2E-04	-71.8

#### Tc-99 in Primary Resin

The unmodified S.F. was  $1.5\text{E-}04$ ; however, this resulted in a nonconservative calculated isotopic concentration for samples 61-1087 and 61-1088; neither of which contained  $\langle\text{LLD}\rangle$  values. Therefore, the S.F. was recalculated using only the positive values of samples 61-1087, and 61-1088, resulting with a conservative factor of  $5.9\text{E-}03$ .

Sample Number	Isotope Conc.	Cs-137			Average Scaling		Calculated	Iso vs. Calc.
		Key Iso. Conc.	Iso/Key Ratio	log Iso/Key	Factor	Iso. Conc.	Factor	
10445	8.2E-05	1.8E+01	4.6E-06	-5.3	6.8E-06	1.2E-04	1.5	
10446	9.3E-04	1.1E+02	8.6E-06	-5.1	6.8E-06	7.5E-04	-1.2	
10447	1.6E-04	2.7E+01	5.9E-06	-5.2	6.8E-06	1.9E-04	1.2	
10556	< 4.2E-04	1.3E+01	3.1E-05	-4.5	6.8E-06	9.2E-05	-4.6	
61-1087	< 1.9E-05	8.0E+00	2.4E-06	-5.6	6.8E-06	5.5E-05	2.9	
61-1088	< 8.9E-06	1.5E+00	5.9E-06	-5.2	6.8E-06	1.0E-05	1.2	

Sample Number		Co-60			Average Scaling Factor	Calculated Iso. Conc.	Iso vs. Calo. Factor
		Isotope Conc.	Key Iso. Conc.	Iso/Key Ratio: log Iso/Key			
10445	<	9.5E-02	7.3E+01	1.3E-03 -2.9	1.8E-04	1.3E-02	-7.2
10446	<	2.5E-01	1.1E+02	2.4E-03 -2.6	1.8E-04	1.9E-02	-13.1
10447		3.5E-02	3.9E+02	8.9E-05 -4.1	1.8E-04	7.0E-02	2.0
10556		1.8E-03	1.9E+00	9.5E-04 -3.0	1.8E-04	3.4E-04	-5.3
61-1087		2.2E-03	1.7E+02	1.3E-05 -4.9	1.8E-04	3.1E-02	13.9
61-1088	<	3.2E-04	3.2E+01	1.0E-05 -5.0	1.8E-04	5.7E-03	17.9

Elimination of the <LLD values for C-14 in samples 10445,10446 would result in a less conservative Scaling Factor



Sample Number	Isotope Conc	Co-60			Average Sealing Factor	Calculated Iso. Conc	Iso vs. Calc. Factor
		Key Iso. Conc	Iso/Key Ratio	log Iso/Key			
10445	3.7E+00	7.3E+01	5.0E-02	-1.3	3.0E-02	2.2E+00	-1.7
10446	1.2E+01	1.1E+02	1.2E-01	-0.9	3.0E-02	3.2E+00	-3.9
10447	2.3E+00	3.9E+02	5.9E-03	-2.2	3.0E-02	1.2E+01	5.1
10556	2.7E-01	1.9E+00	1.4E-01	-0.8	3.0E-02	5.7E-02	-4.8
61-1087	3.2E+00	1.7E+02	1.9E-02	-1.7	3.0E-02	5.1E+00	1.6
61-1088	2.4E-01	3.2E+01	7.5E-03	-2.1	3.0E-02	9.5E-01	4.0

Sample Number	Isotope Conc.	Co-60			Average Scaling Factor	Calculated Iso. Conc.	Iso vs. Calc. Factor
		Key Iso. Conc.	Iso/Key Ratio	log Iso/Key			
10445	3.6E+01	7.3E+01	4.9E-01	-0.3	3.6E-01	2.6E+01	-1.4
10446	4.1E+01	1.1E+02	3.8E-01	-0.4	3.6E-01	3.8E+01	-1.1
10447	1.0E+02	3.9E+02	2.5E-01	-0.6	3.6E-01	1.4E+02	1.4
10556	6.4E-01	1.9E+00	3.4E-01	-0.5	3.6E-01	6.8E-01	1.1
61-1087	1.0E+02	1.7E+02	5.9E-01	-0.2	3.6E-01	6.0E+01	-1.7
61-1088	6.8E+00	3.2E+01	2.1E-01	-0.7	3.6E-01	1.1E+01	1.7

Pu-241 in Primary Resin (Isotope : Ce-144)

Sample Number	Isotope Conc.	Ce-144			Average Scaling Factor	Calculated Iso. Conc.	Iso vs. Calc. Factor
		Key Iso. Conc.	Iso/Key Ratio	log Iso/Key			
10445	1.7E-02	6.1E-02	2.8E-01	-0.5	3.2E-01	2.0E-02	1.1
10446	2.2E-01	7.2E-01	3.1E-01	-0.5	3.2E-01	2.3E-01	1.0
10447	3.5E-01	2.0E-01	1.7E+00	0.2	3.2E-01	6.5E-02	-5.3
10556	3.0E-03	1.8E-02	1.6E-01	-0.8	3.2E-01	5.9E-03	2.0
61-1087	9.6E-02	2.3E-01	4.2E-01	-0.4	3.2E-01	7.4E-02	-1.3
61-1088	1.6E-02	1.5E-01	1.1E-01	-1.0	3.2E-01	4.8E-02	3.0

Pu-241 in Primary Resin Isotope : Co-60)

Sample Number	Isotope Conc.	Co-60			Average Scaling		Calculated		Iso vs. Calc.	
		Key Iso. Conc.	Iso/Key Ratio	log Iso/Key	Factor		Iso. Conc.		Factor	
10445	1.7E-02	7.3E+01	2.4E-04	-3.6	7.6E-04		5.6E-02		3.2	
10446	2.2E-01	1.1E+02	2.1E-03	-2.7	7.6E-04		8.1E-02		-2.7	
10447	3.5E-01	3.9E+02	8.9E-04	-3.1	7.6E-04		3.0E-01		-1.2	
10556	3.0E-03	1.9E+00	1.6E-03	-2.8	7.6E-04		1.4E-03		-2.1	
61-1087	9.6E-02	1.7E+02	5.6E-04	-3.2	7.6E-04		1.3E-01		1.3	
61-1088	1.6E-02	3.2E+01	5.0E-04	-3.3	7.6E-04		2.4E-02		1.5	

Cm-242 in Primary Res. (Key Isotope : Ce-144)

Sample Number	Isotope Conc.	Ce-144		log Iso/Key	Average Scaling Factor	Calculated Iso. Conc.	Iso vs. Calc. Factor
		Key Iso. Conc.	Iso/Key Ratio				
10445	1.4E-03	6.1E-02	2.2E-02	-1.6	2.5E-03	1.5E-04	-9.1
10446	5.5E-04	7.2E-01	7.6E-04	-3.1	2.5E-03	1.8E-03	3.2
10447	1.9E-03	2.0E-01	9.1E-03	-2.0	2.5E-03	5.0E-04	-3.7
10556	1.9E-04	1.8E-02	1.0E-02	-2.0	2.5E-03	4.5E-05	-4.2
61-1087	2.5E-04	2.3E-01	1.1E-03	-3.0	2.5E-03	5.7E-04	2.3
61-1088	1.9E-05	1.5E-01	1.3E-04	-3.9	2.5E-03	3.7E-04	19.4

No out of spec. nonconservative correlations are observed

Cm-242 in Primary R (Key Isotope : Co-60)

Sample Number	Isotope Conc.	Co-60			Average Scaling Factor	Calculated Iso. Conc.	Iso vs. Calc. Factor
		Key Iso. Conc.	Iso/Key Ratio	log Iso/Key			
10445	1.4E-03	7.3E+01	1.9E-05	-4.7	5.8E-06	4.3E-04	-3.2
10446	5.5E-04	1.1E+02	5.1E-06	-5.3	5.8E-06	6.2E-04	1.1
10447	1.9E-03	3.9E+02	4.7E-06	-5.3	5.8E-06	2.3E-03	1.2
10556	1.9E-04	1.9E+00	1.0E-04	-4.0	5.8E-06	1.1E-05	-17.3
61-1087	2.5E-04	1.7E+02	1.5E-06	-5.8	5.8E-06	9.9E-04	4.0
61-1088	1.9E-05	3.2E+01	5.9E-07	-6.2	5.8E-06	1.9E-04	9.8

Since there is no influence from <LLD values, there is no obvious route to modify Scaling Factor

Pu-238 in Primary Resin (Key Isotope : Ce-144)

Sample Number	Isotope Conc.	Ce-144			Average Scaling Factor	Calculated Iso. Conc.	Iso vs. Calo. Factor
		Key Iso. Conc.	Iso/Key Ratio	log Iso/Key			
10445	1.2E-04	6.1E-02	2.0E-03	-2.7	4.0E-03	2.4E-04	2.0
10446	3.0E-03	7.2E-01	4.2E-03	-2.4	4.0E-03	2.8E-03	-1.1
10447	1.5E-03	2.0E-01	7.4E-03	-2.1	4.0E-03	8.1E-04	-1.9
10556	4.2E-05	1.8E-02	2.3E-03	-2.6	4.0E-03	7.3E-05	1.7
61-1087	1.6E-03	2.3E-01	7.0E-03	-2.2	4.0E-03	9.1E-04	-1.8
61-1088	5.9E-04	1.5E-01	3.9E-03	-2.4	4.0E-03	5.9E-04	1.0

Pu-238 in Primary Reservoir Isotope : Co-60)

Sample Number	Isotope Conc.	Co-60			Average Scaling		Calculated		Iso vs. Calc.
		Key Iso. Conc.	Iso/Key Ratio	log Iso/Key	Factor		Iso. Conc.	Factor	
10445	1.2E-04	7.3E+01	1.6E-06	-5.8	9.4E-06		6.9E-04	5.7	
10446	3.0E-03	1.1E+02	2.9E-05	-4.5	9.4E-06		1.0E-03	-3.0	
10447	1.5E-03	3.9E+02	3.8E-06	-5.4	9.4E-06		3.7E-03	2.5	
10556	4.2E-05	1.9E+00	2.2E-05	-4.7	9.4E-06		1.8E-05	-2.4	
61-1087	1.6E-03	1.7E+02	9.4E-06	-5.0	9.4E-06		1.6E-03	-1.0	
61-1088	5.9E-04	3.2E+01	1.8E-05	-4.7	9.4E-06		3.0E-04	-2.0	



Am-241 in Primary Resin (Isotope : Ce-144)

Sample Number	Isotope Conc.	Ce-144			Average Scaling Factor	Calculated Iso. Conc.	Iso vs. Calc. Factor
		Key Iso. Conc.	Iso/Key Ratio	log Iso/Key			
10445	8.4E-05	6.1E-02	1.4E-03	-2.9	8.6E-04	5.2E-05	-1.6
10446	4.0E-04	7.2E-01	5.6E-04	-3.3	8.6E-04	6.1E-04	1.5
10447	1.3E-04	2.0E-01	6.5E-04	-3.2	8.6E-04	1.8E-04	1.3
10556	9.7E-06	1.8E-02	5.3E-04	-3.3	8.6E-04	1.6E-05	1.6
61-1087	4.0E-04	2.3E-01	1.7E-03	-2.8	8.6E-04	2.0E-04	-2.0
61-1088	1.3E-04	1.5E-01	8.7E-04	-3.1	8.6E-04	1.3E-04	-1.0

Am-241 in Primary Residue (Key Isotope : Co-60)

Sample Number	Isotope Conc.	Co-60			Average Scaling Factor	Calculated Iso. Conc.	Iso vs. Calc. Factor
		Key Iso. Conc.	Iso/Key Ratio	log Iso/Key			
10445	8.4E-05	7.3E+01	1.1E-06	-5.9	2.0E-06	1.5E-04	1.8
10446	4.0E-04	1.1E+02	3.8E-06	-5.4	2.0E-06	2.2E-04	-1.8
10447	1.3E-04	3.9E+02	3.4E-07	-6.5	2.0E-06	8.0E-04	6.0
10556	9.7E-06	1.9E+00	5.1E-06	-5.3	2.0E-06	3.9E-06	-2.5
61-1087	4.0E-04	1.7E+02	2.4E-06	-5.6	2.0E-06	3.5E-04	-1.2
61-1088	1.3E-04	3.2E+01	4.1E-06	-5.4	2.0E-06	6.5E-05	-2.0

Pu-239 (Pu-240) in Primary Pool (Key Isotope : Ce-144)

Sample Number	Isotope Conc.	Ce-144			Average Scaling Factor	Calculated Iso. Conc.	Iso vs. Calc. Factor
		Key Iso. Conc.	Iso/Key Ratio	log Iso/Key			
10445	9.1E-05	6.1E-02	1.5E-03	-2.8	2.2E-03	1.3E-04	1.5
10446	2.3E-03	7.2E-01	3.3E-03	-2.5	2.2E-03	1.6E-03	-1.5
10447	9.4E-04	2.0E-01	4.6E-03	-2.3	2.2E-03	4.4E-04	-2.1
10556	3.1E-05	1.8E-02	1.7E-03	-2.8	2.2E-03	4.0E-05	1.3
61-1087	6.0E-04	2.3E-01	2.6E-03	-2.6	2.2E-03	5.0E-04	-1.2
61-1088	1.6E-04	1.5E-01	1.1E-03	-3.0	2.2E-03	3.3E-04	2.0

Pu-239 (Pu-240) in Primary (Key Isotope : Co-60)

Sample Number	Isotope Conc.	Co-60			Average Scaling		Calculated	
		Key Iso. Conc.	Iso/Key Ratio	log Iso/Key	Factor	Iso. Conc.	Iso vs. Calc.	Factor
10445	9.1E-05	7.3E+01	1.2E-06	-5.9	5.2E-06	3.8E-04	4.2	
10446	2.3E-03	1.1E+02	2.2E-05	-4.7	5.2E-06	5.5E-04	-4.3	
10447	9.4E-04	3.9E+02	2.4E-06	-5.6	5.2E-06	2.0E-03	2.1	
10556	3.1E-05	1.9E+00	1.6E-05	-4.8	5.2E-06	9.8E-06	-3.2	
61-1087	6.0E-04	1.7E+02	3.5E-06	-5.5	5.2E-06	8.8E-04	1.5	
61-1088	1.6E-04	3.2E+01	5.0E-06	-5.3	5.2E-06	1.7E-04	1.0	

Pu-242 (Np-237) in Primary (Key Isotope : Ce-144)

Sample Number	Isotope Conc.	Ce-144			Average Scaling		Calculated	Iso vs. Calo.
		Key Iso. Conc.	Iso/Key Ratio	log Iso/Key	Factor	Iso. Conc.	Factor	
10445	< 6.9E-07	6.1E-02	1.1E-05	-4.9	4.2E-05	2.5E-06	3.7	
10446	1.3E-05	7.2E-01	1.8E-05	-4.7	4.2E-05	3.0E-05	2.3	
10447	1.2E-05	2.0E-01	5.9E-05	-4.2	4.2E-05	8.5E-06	-1.4	
10556	5.1E-07	1.8E-02	2.8E-05	-4.6	4.2E-05	7.7E-07	1.5	
61-1087	< 4.9E-05	2.3E-01	2.1E-04	-3.7	4.2E-05	9.6E-06	-5.1	
61-1088	< 1.1E-05	< 1.5E-01	7.3E-05	-4.1	4.2E-05	6.3E-06	-1.8	

Pu-242 (Np-237) in Primary Basin (Key Isotope : Co-60)

Sample Number	Isotope Conc.	Ce-144			Average Scaling		Calculated	Iso vs. Calc.
		Key Iso. Conc.	Iso/Key Ratio	log Iso/Key	Factor		Iso. Conc.	Factor
10445	6.9E-07	7.3E+01	9.4E-09	-8.0	9.9E-08		7.3E-06	10.5
10446	1.3E-05	1.1E+02	1.2E-07	-6.9	9.9E-08		1.0E-05	-1.2
10447	1.2E-05	3.9E+02	3.1E-08	-7.5	9.9E-08		3.9E-05	3.2
10556	5.1E-07	1.9E+00	2.7E-07	-6.6	9.9E-08		1.9E-07	-2.7
61-1087	4.9E-05	1.7E+02	2.9E-07	-6.5	9.9E-08		1.7E-05	-2.9
61-1088	1.1E-05	3.2E+01	3.4E-07	-6.5	9.9E-08		3.2E-06	-3.5

No out of spec. nonconservative correlations are observed

Cm-243 (Cm-244) in Primary Basin (Key Isotope : Ce-144)

Sample Number	Isotope Conc.	Ce-144			Average Scaling		Calculated	Iso vs. Calc.
		Key Iso. Conc.	Iso/Key Ratio	log Iso/Key	Factor	Iso. Conc.	Factor	
10445	7.1E-05	6.1E-02	1.2E-03	-2.9	4.6E-04	2.8E-05	-2.5	
10446	6.7E-04	7.2E-01	9.4E-04	-3.0	4.6E-04	3.3E-04	-2.0	
10447	2.6E-04	2.0E-01	1.3E-03	-2.9	4.6E-04	9.4E-05	-2.7	
10556	2.7E-05	1.8E-02	1.5E-03	-2.8	4.6E-04	8.5E-06	-3.2	
61-1087	7.0E-05	2.3E-01	3.0E-04	-3.5	4.6E-04	1.1E-04	1.5	
61-1088	< 2.4E-06	< 1.5E-01	1.6E-05	-4.8	4.6E-04	6.9E-05	28.9	

No out of spec. nonconservative correlations are observed

Cm-243 (Cm-244) in Primary (Key Isotope : Co-60)

Sample Number	Isotope Conc	Co-60		log Iso/Key	Average Scaling Factor	Calculated Iso. Conc.	Iso vs. Calc. Factor
		Key Iso. Conc.	Iso/Key Ratio				
10445	7.1E-05	7.3E+01	9.7E-07	-6.0	1.9E-06	1.4E-04	1.9
10446	6.7E-04	1.1E+02	6.3E-06	-5.2	1.9E-06	2.0E-04	-3.4
10447	2.6E-04	3.9E+02	6.6E-07	-6.2	1.9E-06	7.4E-04	2.9
10556	2.7E-05	1.9E+00	1.4E-05	-4.8	1.9E-06	3.6E-06	-7.6
61-1087	7.0E-05	1.7E+02	4.1E-07	-6.4	1.9E-06	3.2E-04	4.6
61-1088	2.4E-06	3.2E+01	Eliminated	N.A.	1.9E-06	6.0E-05	25.1

See attached explanation



Cm-243 (Cm-244) in Primary Resin (Key Isotope : Co-60)-Unmodified Sealing Factor

Sample Number	Co-60				Average Sealing Factor	Calculated Iso. Conc.	Iso vs. Calc. Factor
	Isotope Conc.	Key Iso. Conc.	Iso/Key Ratio	log Iso/Key			
10445	7.1E-05	7.3E+01	9.7E-07	-6.0	1.1E-06	8.1E-05	1.1
10446	6.7E-04	1.1E+02	6.3E-06	-5.2	1.1E-06	1.2E-04	-5.8
10447	2.6E-04	3.9E+02	6.6E-07	-6.2	1.1E-06	4.3E-04	1.7
10556	2.7E-05	1.9E+00	1.4E-05	-4.8	1.1E-06	2.1E-06	-12.9
61-1087	7.0E-05	1.7E+02	4.1E-07	-6.4	1.1E-06	1.9E-04	2.7
61-1088	2.4E-06	3.2E+01	7.5E-08	-7.1	1.1E-06	3.5E-05	14.7

**Cm-243 (Cm-244) in Primary Resin (Key Isotope : Co-60)**

The unmodified S.F. was  $1.1\text{E}-06$ ; however, this resulted in a nonconservative calculated isotopic concentration for samples 10446, and 10556; of which only 10556 except 61-1088, the only sample containing a LLD value for the isotope, to provide a conservative factor of  $1.9\text{E}-06$ .