



Sellafield Ltd

EHS&Q, Environmental Management

Sellafield Discharges and Environmental Monitoring 2010

A Preliminary Assessment

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EHS&Q Environmental Management



Liquid Discharges 2010

Nuclide	Limit GBq	2009 Discharge GBq	2010 Discharge GBq	2010 Discharge as % of limit
H-3	2.00E+07	1.51E+06	1.39E+06	7%
C-14	2.10E+04	8.19E+03	4.37E+03	21%
Co-60	3.60E+03	8.25E+01	9.81E+01	3%
Sr-90	4.80E+04	2.86E+03	1.02E+03	2%
Zr/Nb-95	2.80E+03	1.93E+02	2.37E+02	8%
Tc-99	1.00E+04	3.08E+03	1.41E+03	14%
Ru-106	5.10E+04	3.16E+03	1.16E+03	2%
I-129	2.00E+03	2.53E+02	2.74E+02	14%
Cs-134	1.60E+03	1.41E+02	1.10E+02	7%
Cs-137	3.40E+04	4.27E+03	4.85E+03	14%
Ce-144	4.00E+03	4.98E+02	5.70E+02	14%
Np-237	7.30E+02	5.21E+01	4.08E+01	6%
Pu-Alpha	7.00E+02	1.20E+02	1.34E+02	19%
Pu-241	2.50E+04	2.87E+03	3.16E+03	13%
Am-241	3.00E+02	4.63E+01	2.88E+01	10%
Cm-243+244	5.00E+01	4.52E+00	2.92E+00	6%
Alpha	1.00E+03	1.54E+02	1.34E+02	13%
Beta	2.20E+05	1.78E+04	1.14E+04	5%
Uranium (kg)	2000	409	252	13%

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Liquid Discharges 2010

- There were no exceedances of discharge limits in 2010.
- The highest discharge as a proportion of the limit was C-14 at 21% of the limit.
- Compared to the previous year most discharges (11 out of 19) have decreased by 10% or more.
- The largest decreases occurred for;
 - Sr-90 at 64%,
 - Ru-106 at 63%.
- The largest increases occurred for;
 - Zr/Nb-95 at 23%,
 - Co-60 at 19%.

Liquid Critical Group Doses 2010 – measured

Nuclide	Dose in 2009 μ Sv ⁽¹⁾	Dose in 2010 μ Sv ⁽²⁾
C-14	7.4	6.4
Co-60	0.2	0.22
Sr-90	1.3	1.5
Tc-99	3.1	3.0
Ru-106	3.5	1.7
Ag-110 ^m	0.02	0.01
Sb-125	0.05	0.05
I-129	0.25	
Cs-137	4.5	4.6
Np-237	0.03	0.03
Pu-Alpha	38	43
Pu-241	4.3	4.4
Am-241	63	70
Cm-Alpha	0.11	
External	32	33 ⁽³⁾
Total dose	158	168

1. Taken from 2009 Annual report
2. Taken from Quarter 4, 2010 Statutory Environmental Monitoring report
3. External dose for 2010 not available therefore 2009 value from RIFE used

Liquid Critical Group Doses 2010 – measured

- As in previous years, the adult age group corresponds to the critical group.
- Total measured dose has increased in 2010 to 168 μSv from 158 μSv in 2009.
 - This is mainly as a consequence of higher measured concentrations of Pu Alpha and Am-241 in winkles and mussels.
- These two actinides are still the most significant in dose terms, contributing 113 μSv (67%) of the total dose, although the measured concentrations of these nuclides are mostly due to historic rather than 2010 discharges.
- Where analysis results are at the limits of detection the values are treated as positive and included in the assessment.
- The measured doses have been assessed by using the five year average (2005-2009) of habit surveys reported by Food Standards Agency.
- Consumption rates reached their peak in 2006 – 2007 and are now showing a slight decline.
- The total predicted dose received by the critical group from Sellafield liquid discharges in 2010 was 20 μSv and is 24% lower than the predicted dose from discharges in 2009.

Aerial Discharges 2010

Nuclide	Limit MBq	2009 Discharge MBq	2010 Discharge MBq	2010 Discharge as % of limit
H-3	1.10E+09	1.88E+08	9.76E+07	9%
C-14	3.30E+06	3.79E+05	2.72E+05	8%
Kr-85	4.40E+11	4.17E+10	4.53E+10	10%
Sr-90	7.10E+02	3.85E+01	4.00E+01	6%
Ru-106	2.30E+04	9.70E+02	7.54E+02	3%
Sb-125	3.00E+04	1.13E+04	7.40E+03	25%
I-129	7.00E+04	7.62E+03	9.64E+03	14%
I-131	3.70E+04	6.90E+02	3.76E+02	1%
Cs-137	5.80E+03	1.22E+02	9.33E+01	2%
Rn-222	5.00E+05	4.26E+04	4.26E+04	9%
Pu(α)	1.90E+02	2.86E+01	1.96E+01	10%
Pu-241	3.00E+03	3.57E+02	2.16E+02	7%
Am-241/Cm-242	1.20E+02	1.85E+01	1.66E+01	14%
Alpha	8.80E+02	5.01E+01	4.17E+01	5%
Beta	4.20E+04	2.77E+02	2.39E+02	1%

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Aerial Discharges 2010

- There were no exceedances of discharge limits in 2010.
- The highest discharge as a proportion of the limit was Sb-125 at 25% of the limit.
- Compared to the previous year most discharges (11 out of 15) have decreased by 10% or more.
- The largest decreases occurred for;
 - H-3 at 48%,
 - I-131 at 46%.
- The largest increases occurred for;
 - I-129 at 27%,
 - Kr-85 at 9 %.

Aerial Critical Group Doses 2010 – measured

Nuclide	Dose in 2009 μSv ⁽¹⁾	Dose in 2010 μSv ⁽²⁾
H-3	0.31	0.12
C-14	1.4	0.41
Co-60	0.38 ⁽⁴⁾	
Kr-85 ⁽³⁾	0.45	0.39
Sr-90	5.5	4.8
Ru-106 ⁽³⁾	0.003	0.002
Sb-125	0.34	0.19
I-129	1.2	0.84
I-131 ⁽³⁾	0.08	0.04
Cs-134	0.001	0.00006
Cs-137	1.2	1.9
Pu(α)	0.23	0.10
Pu-241	0.06	0.04
Am-241/Cm-242	0.26	0.06
Total	11	9.0

1. Taken from 2009 Annual report
2. Taken from Quarter 4, 2010 Statutory Environmental Monitoring report
3. Based on modelled doses
4. From FSA data

Aerial Critical Group Doses 2010 – measured

- As in previous years, the infant age group corresponds to the critical group.
- Total measured dose has decreased in 2010 to 9 μSv from 11 μSv in 2009
 - This is mainly as a consequence of not including the FSA data in the 2010 estimate.
 - The estimate for 2009 excluding FSA data was 8.3 μSv .
- The main contribution to this dose continues to be from milk consumption;
 - Sr-90 at 4.8 μSv ,
 - Cs-137 1.9 μSv .
- Where analysis results are at the limits of detection the values are treated as positive and included in the assessment.
- The measured doses have been assessed by using consumption rates for terrestrial foods are based on national habit surveys as recommended by HPA.
- The total predicted dose received by the critical group from Sellafield aerial discharges in 2010 was 4.4 μSv and is 14% lower than the predicted dose from discharges in 2009.