

SITE	Sellafield		
SITE OWNER	Nuclear Decommissioning Authority		
WASTE CUSTODIAN	Sellafield Limited		
WASTE TYPE	ILW		
Is the waste subject to Scottish Policy:	No		
WASTE VOLUMES		Conditioned	Packaged
Stocks:	At 1.4.2022.....	1.9 m ³	2.3 m ³
Total future arisings:		0 m ³	0 m ³
Total waste volume:		1.9 m ³	2.3 m ³
Number of waste packages in stock:	At 1.4.2022.....	4 package(s)	
Comment on volumes:	Stock volume is based upon drums conditioned and put to store. Arisings uncertainty due to waste exported from PFSP, but not conditioned by WEP yet.		
Uncertainty factors on volumes:	Stock (upper): x 1.0 Stock (lower): x 1.0	Arisings (upper) x Arisings (lower) x	
WASTE SOURCE	Isotope and spent fuel handling operations, general production waste (including scrap equipment), some items from clean up/initial decommissioning of Windscale Piles. This stream now includes all the pond and bay furniture such as trolleys, bogies, tables, tanks and decanner equipment.		
PHYSICAL CHARACTERISTICS			
General description:	This stream is solid waste which includes isotope cartridges, reactor holding down weights and reactivity control cartridges, mops, buckets, clothing, scaffolding, wire, assorted scrap metal, boxes and baskets. These wastes arise from early site operations and the clean up of the Windscale Piles. Some items will need to be reduced in size before packaging, particularly in-pond storage boxes and redundant equipment. Also includes pond and bay furniture. Waste has been retrieved from the pond, placed into baskets, drip dried and sent to WEP for processing by entombment in cementitious grout		
Physical components (%vol):	ILW waste stream comprises the following: Isotopes (3.1%); Reactor components including holding down weights, support struts, flux flattening steels and empty isotope cans (4%); Magnox swarf, general waste items in skips including reactor thermocouple wire, boxes, baskets and miscellaneous scrap (86.5%); Pond and Bay furniture (6.4%). All		
Sealed sources:	The waste does not contain sealed sources.		
Bulk density (t/m ³):	~1.89		
Comment on density:	Weights and volumes for each component of this stream have been estimated from skip contents and tele/video surveys, and using drawings/data sheets of the individual items. Density quoted is gross weight divided by gross volume of the whole stream. Bulk density will vary substantially between different components.		
CHEMICAL COMPOSITION			
General description and components (%wt):	Mild steel, stainless steel, aluminium, Magnox, nickel/chrome and nickel/aluminium (wire), cobalt, graphite, bismuth oxide, lead, lithium/magnesium alloy, aluminium nitride. Cellulosic material may be present.		
Chemical state:	Neutral		
Chemical form of radionuclides:	Ra: Present as metal. Th: No characterisation data available U: Present as metal. Pu: Present as metal.		
Metals and alloys (%wt):	None as only the debris part of the waste stream.		

WASTE STREAM**2D12/C****Conditioned MBGW in PFSP**

	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....	23.8		
Other ferrous metals.....	6.3		
Iron.....			
Aluminium.....	0.30		
Beryllium.....	P		
Cobalt.....	0		
Copper.....	NE		
Lead.....			
Magnox/Magnesium.....	4.0		
Nickel.....	2.0		
Titanium.....	0		
Uranium.....	1.4		
Zinc.....	P		
Zircaloy/Zirconium.....	NE		
Other metals.....	P	Antimony, beryllium, lithium/magnesium alloy, nickel/chrome and nickel/aluminium. Weights not available, but all present individually in small quantities. Volumes of materials are difficult to quantify.	

Organics (%wt):

Miscellaneous debris in pond may include paper, polythene sheet and bags, cable clips, contaminated clothing, etc. PVC and/or rubber may be present but only in small quantities.

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulosics.....	NE		
Paper, cotton.....	NE		
Wood.....	NE		
Halogenated plastics	NE		
Total non-halogenated plastics....	NE		
Condensation polymers.....	NE		
Others.....	NE		
Organic ion exchange materials....	0		
Total rubber.....	NE		
Halogenated rubber	NE		
Non-halogenated rubber.....	NE		
Hydrocarbons.....			
Oil or grease			
Fuel.....			
Asphalt/Tarmac (cont.coal tar)...			
Asphalt/Tarmac (no coal tar)....			
Bitumen.....			
Others.....			
Other organics.....	NE		

Other materials (%wt):

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WASTE STREAM

2D12/C

Conditioned MBGW in PFSP

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials..	0		
Inorganic sludges and flocs.....	1.3	Magnesium oxide and sludge carryover	
Soil.....	0		
Brick/Stone/Rubble.....	0		
Cementitious material.....	57.1		
Sand.....			
Glass/Ceramics.....			
Graphite.....	3.8		
Desiccants/Catalysts.....			
Asbestos.....	NE		
Non/low friable.....			
Moderately friable.....			
Highly friable.....			
Free aqueous liquids.....	0		
Free non-aqueous liquids.....	0		
Powder/Ash.....	0		

Inorganic anions (%wt): Oxides, aluminate, nitrides. Activation products may include carbide in trace quantities.

	(%wt)	Type(s) and comment
Fluoride.....	NE	
Chloride.....	TR	
Iodide.....	NE	
Cyanide.....	0	
Carbonate.....	TR	
Nitrate.....	NE	
Nitrite.....	NE	
Phosphate.....	NE	
Sulphate.....	NE	
Sulphide.....	TR	

Materials of interest for waste acceptance criteria: Toxic metals are generally contained in isotope cartridges. However, the integrity of the cartridges is unknown.

	(%wt)	Type(s) and comment
Combustible metals.....	0	
Low flash point liquids.....	0	
Explosive materials.....	0	
Phosphorus.....	0	
Hydrides.....	0	
Biological etc. materials.....	0	
Biodegradable materials.....	0	
Putrescible wastes.....	0	

WASTE STREAM	2D12/C	Conditioned MBGW in PFSP
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Non-putrescible wastes.....	0
Corrosive materials.....	0
Pyrophoric materials.....	0
Generating toxic gases.....	
Reacting with water.....	
Higher activity particles.....	0
Soluble solids as bulk chemical compounds.....	0

Hazardous substances / -
non hazardous pollutants:

	(%wt)	Type(s) and comment
Acrylamide.....	0	
Benzene.....	0	
Chlorinated solvents.....	0	
Formaldehyde.....	0	
Organometallics.....	0	
Phenol.....	0	
Styrene.....	0	
Tri-butyl phosphate.....	0	
Other organophosphates.....	0	
Vinyl chloride.....	0	Trace in inventory.
Arsenic.....	0	
Barium.....		
Boron.....		
Boron (in Boral).....	0	
Boron (non-Boral).....	0	
Cadmium.....		
Caesium.....		
Selenium.....		
Chromium.....		
Molybdenum.....		
Thallium.....		
Tin.....		
Vanadium.....		
Mercury compounds.....		
Others.....		
Electronic Electrical Equipment (EEE)		
EEE Type 1.....		
EEE Type 2.....		
EEE Type 3.....		
EEE Type 4.....		
EEE Type 5.....		

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Complexing agents (%wt): Not yet determined

(%wt) Type(s) and comment

EDTA.....

DPTA.....

NTA.....

Polycarboxylic acids.....

Other organic complexants.....

Total complexing agents.....

Potential for the waste to contain discrete items: No.

PACKAGING AND CONDITIONING

Container type:

Container	Waste packaged (%vol)	Waste loading (m ³)	Payload (m ³)	Number of packages
500 l drum (basket for waste)	100.0	~0.47	0.47	4

Container type comment:

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Range in container waste volume:

Waste container loading will be variable due to variable nature of waste. Have only received 4 drums so far which confirms variable nature of the waste.

Other information on containers:

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Conditioned density (t/m³):

2.55

Conditioned density comment:

1200 kg / 0.47 m³

Other information on conditioning:

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RADIOACTIVITY

Source:

Activity originates from Cobalt and other isotope cartridges irradiated in Piles 1 and 2 and Calder reactors, activated fuel stringer and reactor control components. Also components such as bay pond furniture contaminated by fuel and pond water activity. Magnox swarf is now included in this stream.

Uncertainty:

The data given is that for the whole MBGW in PFSP stream. The specific activity data has been updated to align with LoC submission for processing inWEP

Definition of total alpha and total beta/gamma:

The beta activity is derived from estimates of the known quantities of cobalt and other MBGW that comprise this waste stream.

Measurement of radioactivities:

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Other information:

No information on other radionuclides.

WASTE STREAM

2D12/C

Conditioned MBGW in PFSP

Nuclide	Mean radioactivity, TBq/m ³				Nuclide	Mean radioactivity, TBq/m ³			
	Waste at 1.4.2022	Bands and Code	Future arisings	Bands and Code		Waste at 1.4.2022	Bands and Code	Future arisings	Bands and Code
H 3	3.13E-02	E C 2			Gd 153	1.37E-31	BB 8		
Be 10	5.74E-08	BB 2			Ho 163	1.03E-12	BB 8		
C 14	1.47E-02	E B 2			Ho 166m	2.00E-09	BB 2		
Na 22					Tm 170	9.76E-64	BB 8		
Al 26					Tm 171	4.43E-08	BB 2		
Cl 36	1.36E-06	CB 2			Lu 174	1.38E-25	BB 8		
Ar 39	1.66E-04	CB 2			Lu 176	8.92E-16	BB 8		
Ar 42	5.60E-12	CB 8			Hf 178n	2.83E-15	BB 8		
K 40	1.91E-09	CB 2			Hf 182	1.14E-15	BB 8		
Ca 41	1.09E-05	BB 2			Pt 193	5.13E-08	BB 2		
Mn 53	1.79E-13	CB 8			Tl 204	9.13E-07	BB 2		
Mn 54	1.85E-28	CB 8			Pb 205	3.61E-07	BB 2		
Fe 55	8.03E-04	CB 2			Pb 210	6.12E-08	BB 2		
Co 60	3.75E-01	BB 2			Bi 208	2.03E-13	BB 8		
Ni 59	6.48E-01	CB 2			Bi 210m	3.06E-15	BB 8		
Ni 63	5.54E+01	CB 2			Po 210	7.35E-10	BA 2		
Zn 65					Ra 223	8.05E-09	BA 2		
Se 79	1.72E-06	CB 2			Ra 225	8.41E-13	BA 2		
Kr 81	1.57E-10	CB 8			Ra 226	2.87E-09	BA 2		
Kr 85	7.41E-03	BB 2			Ra 228	1.35E-10	BA 8		
Rb 87	2.02E-07	BB 2			Ac 227	1.15E-08	BA 2		
Sr 90	6.42E-01	BB 2			Th 227	8.05E-09	BA 2		
Zr 93	6.12E-05	BB 2			Th 228	2.79E-09	BA 2		
Nb 91	5.81E-11	BB 8			Th 229	1.26E-11	BA 8		
Nb 92	8.65E-13	BB 8			Th 230	2.30E-07	BA 2		
Nb 93m	2.24E-04	BB 2			Th 232	1.35E-10	BA 8		
Nb 94	1.79E-03	BB 2			Th 234	2.72E-04	BA 2		
Mo 93	1.30E-04	BB 2			Pa 231	2.27E-08	BA 2		
Tc 97	3.50E-10	BB 2			Pa 233	5.37E-07	BA 2		
Tc 99	4.68E-04	BB 2			U 232	1.01E-08	BA 2		
Ru 106	2.78E-10	BB 2			U 233	6.79E-10	BA 8		
Pd 107	1.87E-06	BB 2			U 234	4.33E-04	BA 2		
Ag 108m	2.61E-10	BB 2			U 235	1.83E-05	BA 2		
Ag 110m	2.72E-28	BB 8			U 236	9.72E-06	BA 2		
Cd 109	2.38E-09	BB 2			U 238	4.42E-04	BA 2		
Cd 113m	1.52E-04	BB 2			Np 237	2.16E-06	BA 2		
Sn 119m	1.20E-27	BB 8			Pu 236	4.21E-11	BA 8		
Sn 121m	4.83E-05	BB 2			Pu 238	9.29E-04	BA 2		
Sn 123	5.50E-55	BB 8			Pu 239	6.84E-02	BA 2		
Sn 126	1.55E-05	BB 2			Pu 240	2.13E-02	BA 2		
Sb 125	1.77E-06	BB 2			Pu 241	6.04E-02	BA 2		
Sb 126	5.22E-07	BB 2			Pu 242	1.90E-06	BA 2		
Te 125m	4.43E-09	BB 2			Am 241	3.28E-02	BA 2		
Te 127m	3.78E-64	BB 8			Am 242m	7.59E-06	BA 2		
I 129	8.92E-07	BB 2			Am 243	1.16E-06	BA 2		
Cs 134	7.63E-10	BB 8			Cm 242	1.31E-08	BA 8		
Cs 135	2.49E-05	BB 2			Cm 243	1.81E-07	BA 2		
Cs 137	8.13E-01	BB 2			Cm 244	7.60E-07	BA 2		
Ba 133	2.99E-12	BB 8			Cm 245	6.54E-11	BA 8		
La 137	4.56E-12	BB 8			Cm 246	1.40E-11	BA 8		
La 138	2.88E-13	BB 8			Cm 248	5.69E-27	BA 8		
Ce 144	3.80E-11	BB 8			Cf 249	7.51E-17	BA 8		
Pm 145	5.91E-07	BB 2			Cf 250	2.41E-21	BA 8		
Pm 147	1.48E-06	BB 2			Cf 251	6.23E-23	BA 8		
Sm 147	2.07E-10	BB 2			Cf 252	3.14E-28	BA 8		
Sm 151	2.43E-02	BB 2			Other a		BA 2		
Eu 152	8.54E-06	BB 2			Other b/g		BA 2		
Eu 154	1.38E-04	BB 2			Total a	-2.70E-01	CC 2	0	
Eu 155	2.13E-05	BB 2			Total b/g	-7.03E+03	BB 2	0	

Bands (Upper and Lower)

A a factor of 1.5

B a factor of 3

C a factor of 10

D a factor of 100

E a factor of 1000

Note: Bands quantify uncertainty in mean radioactivity.

Code

1 Measured activity

2 Derived activity (best estimate)

3 Derived activity (upper limit)

4 Not present

5 Present but not significant

6 Likely to be present but not assessed

7 Present in significant quantities but not determined

8 Not expected to be present in significant quantity