

WASTE STREAM	2D25	MSSS - Compartment 15
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SITE Sellafield

SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Sellafield Ltd

WASTE TYPE ILW

WASTE VOLUMES

	Reported (m ³)	OR	Conditioned (m ³)	Packaged (m ³)
Stocks:	At 1.4.2025			
Future arisings:				
Total future arisings:				
Total waste volume:				

Number of waste packages in stock: At 1.4.2025..... - packages

Comment on arising rates: There are no future arisings.

Additional information on quantities: Bulk and absolute volumes of tipped MBGW uncertain. Bulk volume expected to be modified as more information becomes available during retrieval operations.

Uncertainty factors on volumes:

Stock (upper):	x 1.50	Arisings (upper):	x -
Stock (lower):	x 0.66	Arisings (lower):	x -

WASTE SOURCE MBGW waste from general site operations and other off-site establishments.

PHYSICAL CHARACTERISTICS

General description: The waste is a very wide variety of items; loose, containerised, whole, broken and compacted. It includes a wide variety of materials; metals, graphite, organics and inorganics. It also includes a small amount of Magnox items, and a very small amount of fissile material. The sources of the waste include redundant and broken, contaminated equipment from reprocessing and other site operations, and contaminated and activated reactor parts from various sites. The waste stream is stored under water, and includes some corrosion products, including a small amount of Magnox and sludge. A small amount of limestone aggregate is present at the bottom of the compartment. Items are of a very wide size range, but generally less than 2 metres long.

Changes since waste generated: MBGW waste and packaging expected to degrade in storage.

Bulk density (t/m³): = 1.7

Comment on density: Bulk density is solids only - includes water content based on assumptions of draining characteristics. Bulk density including interstitial liquor = 2.15t/m³, bulk density with cover liquor and interstitial liquor = 2.04t/m³. Average decanning debris is ~1.6t/m³ and average MBGW is ~3.2t/m³.

CHEMICAL COMPOSITION

General description and components (%wt): Magnox swarf (0%), Magnox sludge (0%), Al₂O₃ (2.05%), UO₂/U₃O₈ (0%), MBGW (scrap, filters, cans, etc.) (72.83%), aggregate (limestone) (1.44%), water (23.68%), others (0%). Includes interstitial liquor and cover liquor, total waste volume including cover liquor is 426 m³.

Chemical state: Neutral

Sheet metal proportion / thickness: Sheet metal (incl. uncrushed tins) 35%v/v; average thickness 4mm. Bulky metal items 23% v/v; average size 160mm dia x 400mm, average volume 20 l. Small items of metal (unknown dimensions) 42%v/v.

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel.....	~ 27.2	Mainly SS316 and SS304.	
Other ferrous metals.....	~ 24.8	Carbon steels.	
Iron.....	P	-	
Aluminium.....	~ 2.1	-	
Beryllium.....	NE	-	
Cobalt.....	P	-	
Copper.....	P	-	
Lead.....	P	-	
Magnox/Magnesium.....	~ 0.02	-	
Nickel.....	NE	-	
Titanium.....	NE	-	
Uranium.....	~ 0.02	-	
Zinc.....	NE	-	
Zircaloy/Zirconium.....	= 0	-	
Other metals.....	= 0	-	

Organics (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulotics.....	~ 1.5	-	
Paper, cotton.....	-	-	
Wood.....	-	-	
Halogenated plastics.....	~ 1.5	-	
Total non-halogenated plastics.....	~ 0.47	-	
Condensation polymers.....	-	-	
Others.....	-	-	
Organic ion exchange materials.....	NE	-	
Total rubber.....	NE	-	
Halogenated rubber.....	-	-	
Non-halogenated rubber.....	-	-	
Hydrocarbons.....	-	-	
Oil or grease.....	~ 0.05	-	
Fuel.....	NE	-	
Asphalt/Tarmac (cont.coal tar).....	NE	-	
Asphalt/Tarmac (no coal tar).....	NE	-	
Bitumen.....	NE	-	
Others.....	NE	-	
Other organics.....	~ 0.18	-	

Other materials (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials.....	NE	-	
Inorganic sludges and flocs.....	= 0	-	
Soil.....	NE	-	
Brick/Stone/Rubble.....	~ 1.4	-	
Cementitious material.....	TR	-	
Sand.....	NE	-	
Glass/Ceramics.....	= 0	-	
Graphite.....	~ 6.8	-	
Desiccants/Catalysts.....	NE	-	
Asbestos.....	NE	-	
Non/low friable.....	-	-	
Moderately friable.....	-	-	
Highly friable.....	-	-	
Free aqueous liquids.....	~ 23.7	Includes interstitial liquor and cover liquor. Total waste volume including cover liquor is 426 m3.	
Free non-aqueous liquids.....	NE	-	
Powder/Ash.....	NE	-	

COMPONENTS OF MATERIALS, WASTE PROPERTIES, MATERIALS NOT CONTRIBUTING TO MASS

Inorganic anions (%wt):

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

Materials of interest for waste acceptance criteria:

	(%wt)	Type(s) and comment
Combustible metals.....	= 0	-
Low flash point liquids.....	= 0	-
Explosive materials.....	= 0	-
Phosphorus.....	= 0	-
Hydrides.....	= 0	Trace UH3 passivated.
Biological etc. materials.....	= 0	-
Biodegradable materials.....	P	<4%.
Putrescible wastes.....	P	<2%.
Non-putrescible wastes.....	P	<2%.
Corrosive materials.....	= 0	-
Pyrophoric materials.....	= 0	-
Generating toxic gases.....	= 0	-
Reacting with water.....	P	<2%.
Higher activity particles.....	P	-
Soluble solids as bulk chemical compounds.....	P	Hydroxides, chlorides and carbonates.

Hazardous substances / non hazardous pollutants:

	(%wt)	Type(s) and comment
Acrylamide.....		-
Benzene.....	= 0	-
Chlorinated solvents.....		-
Formaldehyde.....		-
Organometallics.....		-
Phenol.....	= 0	-
Styrene.....		-
Tri-butyl phosphate.....	NE	-
Other organophosphates.....		-
Vinyl chloride.....	= 0	-
Arsenic.....	= 0	-
Barium.....		-
Boron.....	NE	-
Boron (in Boral).....		-
Boron (non-Boral).....		-
Cadmium.....	NE	-
Caesium.....		-
Selenium.....	= 0	-
Chromium.....	= 0	-
Molybdenum.....	NE	-
Thallium.....		-
Tin.....	= 0	-
Vanadium.....	NE	-
Mercury compounds.....		-
Others.....	NE	-

Complexing agents (%wt):

Not yet determined		
	(%wt)	Type(s) and comment
EDTA.....		-
DPTA.....		-
NTA.....		-
Polycarboxylic acids.....		-
Other organic complexants.....		-
Total complexing agents.....	NE	-

Physical components:

	Number	Type(s) and comment
Sources.....		-
Electronic & Electrical Equipment (EEE)		-
EEE Type 1.....		-
EEE Type 2.....		-
EEE Type 3.....		-
EEE Type 4.....		-
EEE Type 5.....		-

TREATMENT, PACKAGING AND DISPOSAL

Planned on-site / off-site treatment(s):

Treatment	On-site / Off-site	Stream volume %
Size reduction Decay storage Low force compaction Supercompaction (HFC) Incineration Drying/dewatering/liquid separation Tie down/fixatives/strippable coating/painting application Decontamination Metal treatment Recycling / reuse Thermal treatment, including vitrification Encapsulation Polymer encapsulation Other physical treatment Other chemical treatment Containerisation Treatment not yet determined None		100.0

Comments on planned treatments:

-

Conditioning method:

The waste will be retrieved from MSSS and stored in an unconditioned state for a period of 70 years. Following the period of storage, it will be retrieved (from storage) and conditioned for ultimate disposal to the GDF.

Conditioning plants:

Plant Name	Location

Likely conditioning matrix:

Non-standard

Further information on the conditioning matrix:

5:1 GGBS/CEM 1

Waste Packaging:

Likely container type:

Container	Waste packaged (vol%)	Waste loading (m³)	Payload (m³)	Number of packages	Estimated start date for packaging
Sellafield enhanced 3 m³ box	100.0	0.64	2.2	612	-

Range in container waste loading:

There will be considerable variability in unconditioned waste volume per package due to variations in skip loading and content. The actual number of packages produced is identified in the Sellafield Decommissioning Product and Secondary Waste Plan.
572 Boxes plus 40 from residuals = 612boxes

Other information on packaging and conditioning:

Waste matrix (as retrieved) will be in-filled with grout. A second pour of capping grout will be added. Void spaces between Skip wall and Box wall will be filled with grout.

Conditioned density (t/m³):

~ 2.0

Conditioned density comment:

Density of conditioned waste will be fairly uniform.

Management Routes:

Disposal Route	Stream volume %	Raw density t/m³	Start date
Expected to be consigned to a Near Site, Near Surface Disposal Facility (Scotland)	100.0		
Expected to be Non-NSD HAW managed under Scottish Government's policy			
Expected to be disposed to LLW Vaults NRS Dounreay			
Expected to be consigned to the Geological Disposal Facility			
Expected to be consigned to a Near Surface Disposal Facility			
Expected to be consigned to the LLW Repository			
Expected to be consigned to a Landfill Facility			
Expected to be disposed On-Site			
Expected to be managed by In-Situ Disposal			
Expected to be consigned to an Incineration Facility			
Expected to be consigned to a Metal Treatment Facility			
Expected to be Out of Scope			
Expected to be recycled / reused			
Disposal route not known			

Classification codes for waste expected to be consigned to a landfill facility:

Opportunities for alternative disposal routing: No

Baseline Management Route	Opportunity Management Route	Stream volume (%)	Opportunity Confidence	Comment
-	-	-	-	-

RADIOACTIVITY

Source: The activity mainly arises from activation products of irradiated metals (i.e. Co-60) and partly from contamination with fission products etc. from other processes.

Uncertainty: Best available data have been used. However, accuracy is not good for this waste type.

Measurement of radioactivities: Calculation, based on available data.

Chemical form of radionuclides: H-3: Present in elemental and reacted forms.
C-14: Present in elemental and reacted forms.
Cl-36: Present in elemental and reacted forms.
Se-79: Present in elemental and reacted forms.
Tc-99: Present in elemental and reacted forms.
I-129: Present in elemental and reacted forms.
Ra: Present in elemental forms.
Th: Present in elemental and reacted forms.
U: Present in metallic and reacted forms (oxides and possibly hydride).
Np: Present in elemental and reacted forms.
Pu: Present in metallic and mixed oxide forms.

WASTE STREAM		2D25		MSSS - Compartment 15					
Nuclide	Mean radioactivity, TBq/m³				Nuclide	Mean radioactivity, TBq/m³			
	Waste at 1.4.2025	Bands and Code	Future Arisings	Bands and Code		Waste at 1.4.2025	Bands and Code	Future Arisings	Bands and Code
H 3	3.18E+00	B B 2			Gd 153	2.16E-22	B B 2		
Be 10	1.70E-07	B B 2			Ho 163	2.24E-13	B B 2		
C 14	3.48E-01	B B 2			Ho 166m	6.83E-09	B B 2		
Na 22					Tm 170	2.45E-40	B B 2		
Al 26					Tm 171	2.04E-12	B B 2		
Cl 36	5.76E-06	B B 2			Lu 174				
Ar 39	8.94E-04	B B 2			Lu 176				
Ar 42					Hf 178n				
K 40	5.08E-09	B B 2			Hf 182	6.85E-18	B B 2		
Ca 41	7.30E-05	B B 2			Pt 193				
Mn 53	2.78E-09	B B 2			Tl 204	2.18E-04	B B 2		
Mn 54					Pb 205	1.86E-10	B B 2		
Fe 55	1.09E-01	B B 2			Pb 210	9.15E-11	B B 2		
Co 60	5.23E+00	B B 2			Bi 208				
Ni 59	1.46E+00	B B 2			Bi 210m	1.28E-14	B B 2		
Ni 63	1.43E+02	B B 2			Po 210	5.72E-11	B B 2		
Zn 65					Ra 223	9.08E-11	B B 2		
Se 79	2.56E-07	B B 2			Ra 225	9.42E-12	B B 2		
Kr 81					Ra 226	2.94E-09	B B 2		
Kr 85	3.64E-03	B B 2			Ra 228	3.17E-13			
Rb 87	1.23E-09	B B 2			Ac 227	9.12E-11	B B 2		
Sr 90	1.36E-01	B B 2			Th 227	8.97E-11	B B 2		
Zr 93	8.73E-06	B B 2			Th 228	1.64E-08	B B 2		
Nb 91					Th 229	9.45E-12	B B 2		
Nb 92	2.56E-17	B B 2			Th 230	4.51E-06	B B 2		
Nb 93m	8.63E-03	B B 2			Th 232	1.05E-12	B B 2		
Nb 94	6.09E-03	B B 2			Th 234	4.99E-06	B B 2		
Mo 93	1.12E-02	B B 2			Pa 231	1.81E-10	B B 2		
Tc 97					Pa 233	3.13E-04	B B 2		
Tc 99	2.78E-04	B B 2			U 232	1.60E-08	B B 2		
Ru 106	6.21E-12	B B 2			U 233	6.33E-09	B B 2		
Pd 107	3.89E-07	B B 2			U 234	1.64E-01	B B 2		
Ag 108m	5.56E-11	B B 2			U 235	1.60E-07	B B 2		
Ag 110m	9.26E-20	B B 2			U 236	1.18E-06	B B 2		
Cd 109	1.47E-13	B B 2			U 238	4.99E-06	B B 2		
Cd 113m	1.74E-03	B B 2			Np 237	3.13E-04	B B 2		
Sn 119m					Pu 236	3.07E-11	B B 2		
Sn 121m	3.63E-05	B B 2			Pu 238	5.04E-01	B B 2		
Sn 123					Pu 239	2.33E-03	B B 2		
Sn 126	3.03E-06	B B 2			Pu 240	3.25E-03	B B 2		
Sb 125	7.16E-06	B B 2			Pu 241	5.74E-02	B B 2		
Sb 126	4.24E-07	B B 2			Pu 242	4.35E-06	B B 2		
Te 125m	1.79E-06	B B 2			Am 241	1.02E-02	B B 2		
Te 127m					Am 242m	1.57E-05	B B 2		
I 129	1.33E-07	B B 2			Am 243	2.06E-05	B B 2		
Cs 134	7.47E-07	B B 2			Cm 242	1.29E-05	B B 2		
Cs 135	2.78E-06	B B 2			Cm 243	8.13E-06	B B 2		
Cs 137	1.87E-01	B B 2			Cm 244	3.18E-04	B B 2		
Ba 133	5.61E-06	B B 2			Cm 245	7.12E-08	B B 2		
La 137					Cm 246	1.02E-08	B B 2		
La 138	5.85E-16	B B 2			Cm 248	1.52E-22			
Ce 144	7.01E-15	B B 2			Cf 249	9.00E-14	B B 2		
Pm 145					Cf 250	7.46E-14	B B 2		
Pm 147	3.76E-05	B B 2			Cf 251	2.23E-15	B B 2		
Sm 147	1.13E-15				Cf 252	1.69E-17	B B 2		
Sm 151	1.12E-03	B B 2			Unsp a	2.06E-03			
Eu 152	5.47E-06	B B 2			Unsp b/g	3.34E-01			
Eu 154	9.79E-04	B B 2			Total a	6.86E-01	*	0	*
Eu 155	3.75E-05	B B 2			Total b/g	1.54E+02	*	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 the 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
* Total calculated from the 114 declared radionuclides