

WASTE STREAM	2D06	Plutonium Contaminated Materials; Crates and Filters
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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	= 5053.1		
Future arisings:	1.4.2025 - 31.3.2026	= 2.9		
	1.4.2026 - 31.3.2027	= 0		
	1.4.2027 - 31.3.2028	= 2.9		
	1.4.2028 - 31.3.2029	= 0		
	1.4.2029 - 31.3.2030	= 26.5		
	1.4.2030 - 31.3.2051	= 217.6		
Total future arisings:		249.9		
Total waste volume:		5303.0		

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

Comment on arising rates: There are no anticipated crate arisings. Filters arise on a continual basis from older facilities as part of plant operations and POCO/decommissioning activities.

Additional information on quantities: The stock level provided reflects the current volume held at Sellafield in designated PCM stores, these items are tracked and hence known to a good level of accuracy. Future arisings based on consignor estimates, experience of receipts indicates that there is a 50% uncertainty associated with these predictions.

Uncertainty factors on volumes:

Stock (upper):	x 1.05	Arisings (upper):	x 1.50
Stock (lower):	x 0.95	Arisings (lower):	x 0.50

WASTE SOURCE PCM has arisen principally from Sellafield operations. Some crated waste transferred from the LLWR is known to originate from other UK nuclear facilities.

PHYSICAL CHARACTERISTICS

General description: Contents of crates are predominantly glove boxes, with or without the equipment they contain (e.g. furnaces, ducting, presses etc). Crates are made of timber, S/S or fibreglass and some are covered in driclad (a type of PVC) on steel supports. Most crates (~60%) are less than 2m x 2m x 2m, although the largest is in the region of 4m x 3m x 6m. Components will not fit into 200 litre drums. It is estimated that crates may weigh up to 10,000 kg. Filters are made of mild steel frame with glass fibre insert and aluminium spacers. The filters are double wrapped in PVC and stored in a stillage. Generally each filter is also housed within an individual stainless steel metal case.

Changes since waste generated: -

Bulk density (t/m³): ~ 0.20

Comment on density: The density has been estimated from the available weights and dimensions of crates and filter stillages.

CHEMICAL COMPOSITION

General description and components (%wt): The waste stream comprises metal (~70%), plastic (~18%) wood (~9%), rubber (~3%). This composition includes all crate and filter box materials.

Chemical state: Neutral

Sheet metal proportion / thickness: Both sheet and bulk metals are likely to be present. Proportions not estimated.

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel.....	< 50.2	-	
Other ferrous metals.....	< 15.0	-	
Iron.....	< 0.10	-	
Aluminium.....	< 1.5	-	
Beryllium.....		-	
Cobalt.....	= 0	-	
Copper.....	< 1.0	-	
Lead.....	< 1.0	-	
Magnox/Magnesium.....	TR	-	
Nickel.....		-	
Titanium.....	< 0.50	-	
Uranium.....		-	
Zinc.....	< 0.10	-	
Zircaloy/Zirconium.....	= 0	-	
Other metals.....	= 0	-	

Organics (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulotics.....	< 8.6	-	
Paper, cotton.....	NE	-	
Wood.....	< 8.6	-	
Halogenated plastics.....	< 8.6	-	
Total non-halogenated plastics.....	< 8.6	-	
Condensation polymers.....	= 0	-	
Others.....	< 8.6	-	
Organic ion exchange materials.....	= 0	-	
Total rubber.....	< 3.2	-	
Halogenated rubber.....	< 1.6	-	
Non-halogenated rubber.....	< 1.6	-	
Hydrocarbons.....	= 0	-	
Oil or grease.....	= 0	-	
Fuel.....	= 0	-	
Asphalt/Tarmac (cont.coal tar).....	= 0	-	
Asphalt/Tarmac (no coal tar).....	= 0	-	
Bitumen.....	P	-	
Others.....	= 0	-	
Other organics.....	TR	-	

Other materials (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials.....	P	-	
Inorganic sludges and flocs.....	= 0	-	
Soil.....	= 0	-	
Brick/Stone/Rubble.....	= 0	-	
Cementitious material.....	< 0.50	-	
Sand.....		-	
Glass/Ceramics.....	P	-	
Graphite.....	= 0	-	
Desiccants/Catalysts.....		-	
Asbestos.....	< 0.10	-	
Non/low friable.....	NE	-	
Moderately friable.....	NE	-	
Highly friable.....	NE	-	
Free aqueous liquids.....	< 1.0	-	
Free non-aqueous liquids.....	= 0	-	
Powder/Ash.....	= 0	-	

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.....	= 0	-
Carbonate.....	TR	-
Nitrate.....	TR	-
Nitrite.....	NE	-
Phosphate.....	TR	-
Sulphate.....	TR	-
Sulphide.....	TR	-

Materials of interest for waste acceptance criteria:

	(%wt)	Type(s) and comment
Combustible metals.....	NE	-
Low flash point liquids.....	NE	-
Explosive materials.....	NE	-
Phosphorus.....	NE	-
Hydrides.....	NE	-
Biological etc. materials.....	NE	-
Biodegradable materials.....	NE	-
Putrescible wastes.....	NE	-
Non-putrescible wastes.....	NE	-
Corrosive materials.....	NE	-
Pyrophoric materials.....	NE	-
Generating toxic gases.....	NE	-
Reacting with water.....	NE	-
Higher activity particles.....	NE	-
Soluble solids as bulk chemical compounds.....	NE	-

Hazardous substances / non hazardous pollutants:

	(%wt)	Type(s) and comment
Acrylamide.....	NE	-
Benzene.....	NE	-
Chlorinated solvents.....	NE	-
Formaldehyde.....	NE	-
Organometallics.....	NE	-
Phenol.....	NE	-
Styrene.....	NE	-
Tri-butyl phosphate.....	NE	-
Other organophosphates.....	NE	-
Vinyl chloride.....	NE	-
Arsenic.....	= 0	-
Barium.....	NE	-
Boron.....	NE	-
Boron (in Boral).....		-
Boron (non-Boral).....		-
Cadmium.....	< 0.10	-
Caesium.....	NE	-
Selenium.....	NE	-
Chromium.....	NE	-
Molybdenum.....	NE	-
Thallium.....	NE	-
Tin.....	< 0.10	-
Vanadium.....	NE	-
Mercury compounds.....	NE	-
Others.....	NE	-

Complexing agents (%wt):

Yes		
	(%wt)	Type(s) and comment
EDTA.....		-
DPTA.....		-
NTA.....		-
Polycarboxylic acids.....	= 0	-
Other organic complexants.....	TR	Trace amounts of organic complexing agents may be present.
Total complexing agents.....	TR	-

Physical components:

	Number	Type(s) and comment
Sources.....		-
Electronic & Electrical Equipment (EEE)		-
EEE Type 1.....	P	-
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	On-site	= 100.0

Comments on planned treatments:

-

Conditioning method:

Thermal Treatment

Conditioning plants:

Plant Name	Location
Waste Treatment Complex 2 (WTC2)	Sellafield

Likely conditioning matrix:

Glass

Further information on the conditioning matrix:

R&D to be carried out to determine exact form of conditioning matrix

Waste Packaging:

Likely container type:

Container	Waste packaged (vol%)	Waste loading (m³)	Payload (m³)	Number of packages	Estimated start date for packaging
4 m box (0 mm concrete shielding)	100.0	5.5	15.6	965	2047

Range in container waste loading: 4m box will be pre loaded with 2 crates or gloveboxes which will be treated before additional drummed waste is introduced as top up feed (estimated at 300 additional drums per product box) so all containers will be full until feed runs out.

Other information on packaging and conditioning:

-

Conditioned density (t/m³):

NE

Conditioned density comment:

-

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) 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	= 100.0		2050

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

Opportunities for alternative disposal routing: Yes

Baseline Management Route	Opportunity Management Route	Stream volume (%)	Opportunity Confidence	Comment
GDF	LLWR	~ 1.0	AMBER	26 crates to be processed by active demonstrator project. Will be consigned under 2X89 waste stream.
GDF	LLWR	~ 20.0	AMBER	3,500 filters are projected to be below LLW limits once subject to assay. Will be consigned under 2X41 waste stream.

RADIOACTIVITY

Source: The principal nuclides are Pu-238, Pu-239, Pu-240, Pu241, Pu 242 and Am241.

Uncertainty: The activity accuracy is based on records of arisings.

Measurement of radioactivities: The specific activities were calculated using an average fingerprint for the stream (determined through measurements of several thousand drums of similar provenance through the WTC and EDS assay suites) and the total Pu mass of the current stocks.

Chemical form of radionuclides:

- H-3: -
- C-14: -
- Cl-36: -
- Se-79: -
- Tc-99: -
- I-129: -
- Ra: -
- Th: -
- U: Present as metal, oxide and nitrate.
- Np: -
- Pu: Present as metal, oxide, fluoride and nitrate.

WASTE STREAM		2D06		Plutonium Contaminated Materials; Crates and Filters					
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					Gd 153				
Be 10					Ho 163				
C 14					Ho 166m				
Na 22					Tm 170				
Al 26					Tm 171				
Cl 36					Lu 174				
Ar 39					Lu 176				
Ar 42					Hf 178n				
K 40					Hf 182				
Ca 41					Pt 193				
Mn 53					Tl 204				
Mn 54					Pb 205				
Fe 55					Pb 210				
Co 60					Bi 208				
Ni 59					Bi 210m				
Ni 63					Po 210				
Zn 65					Ra 223				
Se 79					Ra 225				
Kr 81					Ra 226				
Kr 85					Ra 228				
Rb 87					Ac 227				
Sr 90					Th 227				
Zr 93					Th 228				
Nb 91					Th 229				
Nb 92					Th 230				
Nb 93m					Th 232	5.44E-08	B B 2		
Nb 94					Th 234				
Mo 93					Pa 231				
Tc 97					Pa 233				
Tc 99					U 232				
Ru 106					U 233				
Pd 107					U 234				
Ag 108m					U 235	1.21E-07	B B 2		
Ag 110m					U 236				
Cd 109					U 238	4.55E-07	B B 2	3.01E-08	C C 2
Cd 113m					Np 237				
Sn 119m					Pu 236				
Sn 121m					Pu 238	4.82E-03	B B 2	8.75E-03	C C 2
Sn 123					Pu 239	2.31E-02	B B 2	2.03E-02	C C 2
Sn 126					Pu 240	1.11E-02	B B 2	1.67E-02	C C 2
Sb 125					Pu 241	2.48E-01	B B 2	4.95E-01	C C 2
Sb 126					Pu 242	5.52E-06	B B 2	1.04E-05	C C 2
Te 125m					Am 241	9.40E-03	B B 2	8.30E-03	C C 2
Te 127m					Am 242m				
I 129					Am 243				
Cs 134					Cm 242				
Cs 135					Cm 243				
Cs 137					Cm 244				
Ba 133					Cm 245				
La 137					Cm 246				
La 138					Cm 248				
Ce 144					Cf 249				
Pm 145					Cf 250				
Pm 147					Cf 251				
Sm 147					Cf 252				
Sm 151					Unsp a				
Eu 152					Unsp b/g				
Eu 154					Total a	4.84E-02	*	5.41E-02	*
Eu 155					Total b/g	2.48E-01	*	4.95E-01	*

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