

WASTE STREAM	2D130	Miscellaneous Plants Initial/Interim Decommissioning: Processing Plants, Tanks, Silos, etc (PCM)
---------------------	--------------	---

SITE Sellafield
SITE OWNER Nuclear Decommissioning Authority
WASTE CUSTODIAN Sellafield Limited
WASTE TYPE ILW

Is the waste subject to Scottish Policy: No

WASTE VOLUMES

		Reported
Stocks:	At 1.4.2022.....	0 m ³
Future arisings -	1.4.2022 - 31.3.2023.....	0 m ³
	1.4.2023 - 31.3.2024.....	0 m ³
	1.4.2024 - 31.3.2025.....	0 m ³
	1.4.2025 - 31.3.2032.....	0 m ³
	1.4.2032 - 31.3.2034.....	68.0 m ³
	1.4.2034 - 31.3.2036.....	68.0 m ³
	1.4.2036 - 31.3.2037.....	52.0 m ³
	1.4.2037 - 31.3.2043.....	426.0 m ³
	1.4.2043 - 31.3.2044.....	189.0 m ³
	1.4.2044 - 31.3.2048.....	617.0 m ³
	1.4.2048 - 31.3.2050.....	222.0 m ³
	1.4.2050 - 31.3.2051.....	178.0 m ³
	1.4.2051 - 31.3.2052.....	158.0 m ³
	1.4.2052 - 31.3.2055.....	311.0 m ³
	1.4.2055 - 31.3.2061.....	221.0 m ³
	1.4.2061 - 31.3.2072.....	1449.0 m ³
	1.4.2072 - 31.3.2079.....	785.0 m ³
	1.4.2079 - 31.3.2090.....	189.0 m ³
	1.4.2090 - 31.3.2115.....	0 m ³
	1.4.2115 - 31.3.2118.....	81.0 m ³
Total future arisings:		5014.0 m ³
Total waste volume:		5014.0 m ³

Comment on volumes: Arisings are in line with current decommissioning programmes and strategy. Waste within this waste stream is generated from decommissioning projects which will commence at a future date. As a result of this, minimal characterisation of waste volumes and fingerprints has been carried out and hence there is a large uncertainty in the potential arisings. Preliminary assessments indicate that the volumes may vary from -30% to +200% for ILW.

Uncertainty factors on volumes: Stock (upper): x Arisings (upper) x 3.0
 Stock (lower): x Arisings (lower) x 0.7

WASTE SOURCE Dismantling of reprocessing & associated plants, waste storage and treatment plants & site services facilities.

PHYSICAL CHARACTERISTICS

General description: Plant and equipment, internal building fabric and miscellaneous soft waste, i.e. rubber/PVC/paper. Most items size reduced in-situ. Some large items may be present.

Physical components (%vol): Vessels and tanks (42%), Concrete, brick and blockwork (25%), Structural Steel (4%), gloveboxes (2%), pipework, valves and fittings (7%), plant and equipment (7%), ducting (2%), Reinforcing steelwork (2%), soft waste (9%).

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m³): ~0.35

Comment on density: Density stated is average for PCM.

CHEMICAL COMPOSITION

General description and components (%wt): Stainless steel (50.4%), Brick & concrete (30%), mild steel (12.6%), copper (0.2%), aluminium (<0.1%), zinc (<0.1%), plastic (4%), rubber (1.9%), cellulose (0.6%), glass (0.1%). Percentages are by volume.

WASTE STREAM	2D130	Miscellaneous Plants Initial/Interim Decommissioning: Processing Plants, Tanks, Silos, etc (PCM)
---------------------	--------------	---

Chemical state: Neutral

Chemical form of radionuclides: -

Metals and alloys (%wt): Some sheet metal present (~30%), bulk metal (70%). Note that waste composition is by volume.

	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....	50.4	The most commonly used stainless steel is 304L.	
Other ferrous metals.....	12.6		
Iron.....			
Aluminium.....	<0.10		
Beryllium.....			
Cobalt.....			
Copper.....	0.20		
Lead.....	TR		
Magnox/Magnesium.....			
Nickel.....			
Titanium.....			
Uranium.....			
Zinc.....	<0.10		
Zircaloy/Zirconium.....			
Other metals.....			

Organics (%wt): The waste contains PVC and other plastics, small amounts of rubber and cellulose. Percentages are by volume. PVC oversuits, Windscale suits, waste bags, rubber gloves.

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulose.....	0.60		
Paper, cotton.....	TR		
Wood.....	~0.60		
Halogenated plastics	3.0		
Total non-halogenated plastics.....	1.0		
Condensation polymers.....	0.50		
Others.....	0.50		
Organic ion exchange materials....			
Total rubber.....	1.9		
Halogenated rubber	P		
Non-halogenated rubber.....	P		
Hydrocarbons.....			
Oil or grease			
Fuel.....			
Asphalt/Tarmac (cont.coal tar)...			
Asphalt/Tarmac (no coal tar)....			
Bitumen.....			
Others.....			
Other organics.....	0		

WASTE STREAM

2D130

**Miscellaneous Plants Initial/Interim Decommissioning:
Processing Plants, Tanks, Silos, etc (PCM)**

Other materials (%wt): -

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials..	0		
Inorganic sludges and flocs.....	TR		
Soil.....	0		
Brick/Stone/Rubble.....	~20.0		
Cementitious material.....	~10.0		
Sand.....	0		
Glass/Ceramics.....	~0.10		
Graphite.....	0		
Desiccants/Catalysts.....	0		
Asbestos.....	TR	Asbestos cement cladding, sheets, ceiling tiles and roof cladding.	
Non/low friable.....			
Moderately friable.....			
Highly friable.....			
Free aqueous liquids.....	0		
Free non-aqueous liquids.....	0		
Powder/Ash.....	0		

Inorganic anions (%wt): Inorganic anions are not expected to be present.

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

Materials of interest for waste acceptance criteria: Asbestos cement cladding, sheets, ceiling tiles and roof cladding.

	(%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	

WASTE STREAM**2D130****Miscellaneous Plants Initial/Interim Decommissioning:
Processing Plants, Tanks, Silos, etc (PCM)**

Putrescible wastes.....	0
Non-putrescible wastes.....	0
Corrosive materials.....	0
Pyrophoric materials.....	0
Generating toxic gases.....	0
Reacting with water.....	0
Higher activity particles.....	NE
Soluble solids as bulk chemical compounds.....	0

Hazardous substances / Lead and asbestos are present in trace quantities.
non hazardous pollutants:

	(%wt)	Type(s) and comment
Acrylamide.....		
Benzene.....		
Chlorinated solvents.....		
Formaldehyde.....		
Organometallics.....		
Phenol.....		
Styrene.....		
Tri-butyl phosphate.....		
Other organophosphates.....		
Vinyl chloride.....		
Arsenic.....		
Barium.....		
Boron.....		
Boron (in Boral).....		
Boron (non-Boral).....		
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.....		

WASTE STREAM**2D130****Miscellaneous Plants Initial/Interim Decommissioning:
Processing Plants, Tanks, Silos, etc (PCM)**

Complexing agents (%wt): No

(%wt) Type(s) and comment

EDTA.....

DPTA.....

NTA.....

Polycarboxylic acids.....

Other organic complexants.....

Total complexing agents..... 0

Potential for the waste to contain discrete items: Yes. Sealed non compactable drums, final ILW packages and some large identifiable components

PACKAGING AND CONDITIONING

Conditioning method: The waste is assumed to leave decommissioning in 200 litre mild steel drums. Where possible these drums will be supercompacted. Pucks generated and any non-compactable drums will be loaded into 500 litre product drums.

Plant Name: Waste Treatment Complex (WTC) 2 and 3

Location: Sellafield.

Plant startup date: 2034

Total capacity (m³/y incoming waste): -

Target start date for packaging this stream: 2032

Throughput for this stream (m³/y incoming waste): -

Other information: WTC 1 due to operate until April 2035 just prior to this stream starting. WTC2 begins operations in 2034 - waste generated in the interim period is planned to be interim stored in 200 l drums.

Likely container type:	Container	Waste packaged (%vol)	Waste loading (m ³)	Payload (m ³)	Number of packages
	500 l drum (basket for waste)	100.0	~0.239	~0.504	20980

Likely container type comment: Conditioning and packaging factors assume the current average of 6 feed drums being compacted per product drum.

Range in container waste volume: Between 1 and 9 compacted 200l drums will be put into a 500l drum.

Other information on containers: Stainless Steel

Likely conditioning matrix: Pulverised fuel ash/Ordinary Portland cement mixture

Other information: -

Conditioned density (t/m³): 2.0Conditioned density comment: The density of the conditioned product will range from 1.5 to 2.6 t/m³ for drums.

Other information on conditioning: -

Opportunities for alternative disposal routing: Yes

WASTE STREAM**2D130****Miscellaneous Plants Initial/Interim Decommissioning:
Processing Plants, Tanks, Silos, etc (PCM)**

Baseline Management Route	Opportunity Management Route	Stream volume (%)	Estimated Date that Opportunity will be realised	Opportunity Confidence	Comment
Disposal at a Geological Disposal Facility	Disposal at LLWR	20.0	2029	Medium	There is potential for up to 20% of the waste to be diverted to LLWR.

RADIOACTIVITY

Source: The main sources of activity are plutonium isotopes.

Uncertainty:

Waste within this waste stream is generated from decommissioning projects which will commence at a future date. The uncertainties quoted for each nuclide represent both the uncertainty in quantification without detailed sampling and the likely variation of nuclide in different building consigned wastes under this waste stream. It is exceptionally unlikely that all the waste included in this waste stream will have the same variation in nuclide fingerprint. Also activity levels will depend on degree of decontamination achieved.

Definition of total alpha and total beta/gamma:

Where totals are shown on the table of radionuclide activities they are the sums of the listed alpha or beta/gamma emitting radionuclides plus 'other alpha' or 'other beta/gamma'.

Measurement of radioactivities:

-

Other information:

-

WASTE STREAM

2D130

**Miscellaneous Plants Initial/Interim Decommissioning:
Processing Plants, Tanks, Silos, etc (PCM)**

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				8	Gd 153				
Be 10				8	Ho 163				
C 14				8	Ho 166m				
Na 22					Tm 170				
Al 26					Tm 171				
Cl 36				8	Lu 174				
Ar 39					Lu 176				
Ar 42					Hf 178n				
K 40					Hf 182				
Ca 41				8	Pt 193				
Mn 53					Tl 204				
Mn 54				8	Pb 205				
Fe 55				8	Pb 210				8
Co 60				8	Bi 208				
Ni 59				8	Bi 210m				
Ni 63				8	Po 210				8
Zn 65				8	Ra 223				
Se 79				8	Ra 225				
Kr 81					Ra 226				8
Kr 85					Ra 228				
Rb 87					Ac 227				
Sr 90				8	Th 227				
Zr 93				8	Th 228				
Nb 91					Th 229				8
Nb 92					Th 230				8
Nb 93m				8	Th 232				8
Nb 94				8	Th 234				
Mo 93				8	Pa 231				8
Tc 97					Pa 233				
Tc 99				8	U 232				
Ru 106				8	U 233				8
Pd 107				8	U 234		2.49E-08	BC	2
Ag 108m				8	U 235		5.40E-07	BC	2
Ag 110m					U 236		2.49E-08	BC	2
Cd 109					U 238		7.73E-07	BC	2
Cd 113m					Np 237				
Sn 119m					Pu 236				
Sn 121m				8	Pu 238		1.32E-02	BC	2
Sn 123					Pu 239		1.65E-02	BC	2
Sn 126				8	Pu 240		2.28E-02	BC	2
Sb 125					Pu 241		4.81E-01	BC	2
Sb 126					Pu 242		1.55E-05	BC	2
Te 125m					Am 241		4.99E-02	BC	2
Te 127m					Am 242m				
I 129				8	Am 243				
Cs 134				8	Cm 242				
Cs 135				8	Cm 243				
Cs 137				8	Cm 244				
Ba 133					Cm 245				
La 137					Cm 246				
La 138					Cm 248				
Ce 144				8	Cf 249				
Pm 145					Cf 250				
Pm 147				8	Cf 251				
Sm 147					Cf 252				
Sm 151				8	Other a				
Eu 152				8	Other b/g				
Eu 154				8	Total a	0	1.02E-01	BC	2
Eu 155				8	Total b/g	0	4.81E-01	BC	2

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