

WASTE STREAM	2D98	MSSS Secondary ILW from SMF
--------------	------	-----------------------------

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	0		
Future arisings:	1.4.2025 - 31.3.2026	~ 0.2		
	1.4.2026 - 31.3.2027	~ 0.8		
	1.4.2027 - 31.3.2028	~ 0		
	1.4.2028 - 31.3.2029	~ 12.3		
	1.4.2029 - 31.3.2030	~ 7.3		
	1.4.2030 - 31.3.2031	~ 13.9		
	1.4.2031 - 31.3.2032	~ 1.1		
	1.4.2032 - 31.3.2033	~ 31.1		
	1.4.2033 - 31.3.2034	~ 25.0		
	1.4.2034 - 31.3.2035	~ 0.3		
	1.4.2035 - 31.3.2036	~ 7.3		
	1.4.2036 - 31.3.2037	~ 13.9		
	1.4.2037 - 31.3.2038	~ 23.2		
	1.4.2038 - 31.3.2039	~ 19.3		
	1.4.2039 - 31.3.2040	~ 13.9		
	1.4.2040 - 31.3.2041	~ 0.3		
Total future arisings:	169.7			
Total waste volume:	169.7			

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

Comment on arising rates: Secondary waste forecasts have been assumed to start from 2025. Volumes only taken up to 2040.

Additional information on quantities: Uncertainty unknown as predictions made for item failure without knowledge of reliability. 50% assumed.

Uncertainty factors on volumes: Stock (upper): x - Arisings (upper): x 1.50
Stock (lower): x - Arisings (lower): x 0.50

WASTE SOURCE Failed plant tools and items which will be disposed of as ILW in MSSS SEP Skip with other MSSS wastes or via LLW waste routes.

PHYSICAL CHARACTERISTICS

General description: ILW tooling from contact with MSSS wastes, e.g. SEP machine Petal Grab or Clamshell Grab, Modular Rake, Hydraulic Shear Tool, etc. LLW

Changes since waste generated: None assumed

Bulk density (t/m³): ~ 0.93

Comment on density: Total mass to 2040 = 164762.3kg assumed, total volume = 177.09 m3. Assumed forecast based on predicted plant item failure.

CHEMICAL COMPOSITION

General description and components (%wt): Stainless steel (97.23%), Carbon Steel (1.97%), Hydraulic Oil (Renolin 32) (0.04%), HB500 Steel (0.72%), DEVA BM 302 (0.02%), PVC (0.01%), Rubber (0.01%). Small quantities of Oilite, Bronze, Nylon, Aluminium, Loctite. Additional RENOLIN 32 hydraulic oil will be present based on the amount carried over to the waste skip within failed item.

Chemical state: Neutral

Sheet metal proportion / thickness: -

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel.....	= 97.2	-	
Other ferrous metals.....	= 2.7	-	
Iron.....		-	
Aluminium.....	< 0.01	-	
Beryllium.....		-	
Cobalt.....		-	
Copper.....		-	
Lead.....		-	
Magnox/Magnesium.....		-	
Nickel.....		-	
Titanium.....		-	
Uranium.....		-	
Zinc.....		-	
Zircaloy/Zirconium.....		-	
Other metals.....	< 0.01	-	

Organics (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulotics.....		-	
Paper, cotton.....		-	
Wood.....		-	
Halogenated plastics.....	= 0.01	-	
Total non-halogenated plastics.....	< 0.01	-	
Condensation polymers.....		-	
Others.....		-	
Organic ion exchange materials.....		-	
Total rubber.....	= 0.01	-	
Halogenated rubber.....	= 0.01	-	
Non-halogenated rubber.....		-	
Hydrocarbons.....	= 0.04	-	
Oil or grease.....	= 0.04	-	
Fuel.....		-	
Asphalt/Tarmac (cont.coal tar).....		-	
Asphalt/Tarmac (no coal tar).....		-	
Bitumen.....		-	
Others.....		-	
Other organics.....	< 0.01	-	

Other materials (%wt):

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

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

Inorganic anions (%wt):

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

Materials of interest for waste acceptance criteria:

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

Hazardous substances / 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.....	-	-

Complexing agents (%wt):

No		
	(%wt)	Type(s) and comment
EDTA.....	-	-
DPTA.....	-	-
NTA.....	-	-
Polycarboxylic acids.....	-	-
Other organic complexants.....	-	-
Total complexing agents.....	-	-

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
Magnox Swarf Storage Silo (MSSS) Final Conditioning Plant	Sellafield

Likely conditioning matrix:

Non-standard

Further information on the conditioning matrix:

MSSS wastes will be conditioned using an appropriate matrix

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	84.5	0.94	2.1	153	-

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 Retrievals Product and Secondary Waste Plan.

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: Contamination of ILW carryover from contact with MSSS compartment waste.

Uncertainty: Activity unknown as contamination levels and predicitions of number of items unknown.

Measurement of radioactivities: Specific activity not calculated as it depends on the amount of contamination / sludge carryover per waste item from contact with MSSS waste, the associated compartment from which it came. Arisings forecast not detailed enough to calculate this information.

Chemical form of radionuclides:

- H-3: -
- C-14: -
- Cl-36: -
- Se-79: -
- Tc-99: -
- I-129: -
- Ra: -
- Th: -
- U: -
- Np: -
- Pu: -

WASTE STREAM		2D98		MSSS Secondary ILW from SMF					
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				
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				
Ag 110m					U 236				
Cd 109					U 238				
Cd 113m					Np 237				
Sn 119m					Pu 236				
Sn 121m					Pu 238				
Sn 123					Pu 239				
Sn 126					Pu 240				
Sb 125					Pu 241				
Sb 126					Pu 242				
Te 125m					Am 241				
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	0	*	0	*
Eu 155					Total b/g	0	*	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