WASTE STREAM	2D127	Uranium Plants Final Decommissioning: Processing Plants

SITE Sellafield

SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Sellafield Ltd

WASTE TYPE LLW

WASTE VOLUMES

	Reported (m^3)
Stocks: At 1.4.2025	
Future arisings: 1.4.2025 - 31.3.2047	= 0
1.4.2047 - 31.3.2048	~ 247.0
1.4.2065 - 31.3.2068	~ 211.0
Total future arisings:	**458.0**
Total waste volume:	**458.0**

OR

Conditioned (m^3)	Packaged (m^3)

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

Comment on arising rates: Arisings are in line with current decommissioning programmes and strategy.

Additional information on quantities: 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 -50% to +300% for LLW.

Uncertainty factors on volumes:

Stock (upper):	x -	Arisings (upper):	x 4.00
Stock (lower):	x -	Arisings (lower):	x 0.50

WASTE SOURCE Demolition of uranium process plants.

PHYSICAL CHARACTERISTICS

General description: Building structural materials and miscellaneous soft waste i.e. rubber/PVC/paper. Most items size reduced in-situ. Some large items may be present.

Changes since waste generated: -

Bulk density (t/m^3): ~ 1.0

Comment on density: Density stated is average for LLW final decommissioning.

CHEMICAL COMPOSITION

General description and components (%wt): Concrete, bricks and blockwork (69.5%), mild steel (28.5%), fibreglass (0.5%), wood (0.1%), glass (0.05%), plastic (1%), rubber (0.2%), cellulose (0.1%), others (0.1%). Percentages are by volume.

Chemical state: Neutral

Sheet metal proportion / thickness: Some sheet metal present (~30%), bulk metal (70%).

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel……	TR	The most commonly used stainless steel is 304L.	
Other ferrous metals……	= 28.5	-	
Iron……		-	
Aluminium……	TR	-	
Beryllium……	= 0	-	
Cobalt……	= 0	-	
Copper……	TR	-	
Lead……	TR	-	
Magnox/Magnesium……	= 0	-	
Nickel……	= 0	-	
Titanium……		-	
Uranium……	= 0	-	
Zinc……	= 0	-	
Zircaloy/Zirconium……	= 0	-	
Other metals……	= 0.05	-	

Organics (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulosics	= 0.20	-	
Paper, cotton	= 0.10	-	
Wood	= 0.10	-	
Halogenated plastics	= 0.75	-	
Total non-halogenated plastics	= 0.25	-	
Condensation polymers	P	-	
Others	P	-	
Organic ion exchange materials	= 0	-	
Total rubber	= 0.20	-	
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	= 0.05	-	

Other materials (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials	= 0	-	
Inorganic sludges and flocs	= 0	-	
Soil	= 0	-	
Brick/Stone/Rubble	P	-	
Cementitious material	< 69.5	-	
Sand		-	
Glass/Ceramics	~ 0.50	-	
Graphite	= 0	-	
Desiccants/Catalysts		-	
Asbestos	= 0	Asbestos is not expected to be present in this waste stream.	
Non/low friable		-	
Moderately friable		-	
Highly friable		-	
Free aqueous liquids	= 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	= 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:

	(%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	-
Non-putrescible wastes	= 0	-
Corrosive materials	= 0	-
Pyrophoric materials	= 0	-
Generating toxic gases	= 0	-
Reacting with water	= 0	-
Higher activity particles	= 0	-
Soluble solids as bulk chemical compounds	= 0	-

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	= 0	-

Physical components:

	Number	Type(s) and comment
Sources	= 0	-
Electronic & Electrical Equipment (EEE)		-
EEE Type 1	NE	-
EEE Type 2	NE	-
EEE Type 3	NE	-
EEE Type 4	NE	-
EEE Type 5	NE	-

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	Off-site	= 24.0
Recycling / reuse		
Thermal treatment, including vitrification		
Encapsulation		
Polymer encapsulation		
Other physical treatment		
Other chemical treatment		
Containerisation		
Treatment not yet determined		
None		= 76.0

Comments on planned treatments: Although there are no firm plans in place, based on current experience we have assumed the treatment methods set out in the table for the purposes of the 2025 UK Inventory. Waste not requiring treatment is assumed to be suitable for landfill.

Conditioning method: -

Conditioning plants:

Plant Name	Location

Likely conditioning matrix: -

Further information on the conditioning matrix: -

Waste Packaging:

Likely container type:

Container	Waste packaged (vol%)	Waste loading (m^3)	Payload (m^3)	Number of packages	Estimated start date for packaging
-	-	-	-	-	-

Range in container waste loading: -

Other information on packaging and conditioning: -

Conditioned density (t/m^3): -
Conditioned density comment: -

Management Routes:

Disposal Route	Stream volume %	Raw density t/m^3	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	= 76.0	= 1.5	
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	= 24.0	= 1.4	
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: 17 01 01

Opportunities for alternative disposal routing: Yes

Baseline Management Route	Opportunity Management Route	Stream volume (%)	Opportunity Confidence	Comment
Landfill	Recycled / reused	~ 38.0	AMBER	Potential to reuse active concrete during final site closure is being investigated

RADIOACTIVITY

Source: The main sources of activity are uranium isotopes.

Uncertainty: Waste within this waste stream is generated from a number of 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 nuclides in different buildings 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.

Measurement of radioactivities: -

Chemical form of radionuclides:

H-3: The chemical form of tritium has not been determined.
C-14: The chemical form of carbon-14 has not been determined.
Cl-36: Chlorine-36 is not expected to be present in significant quantity.
Se-79: Selenium is not expected to be present in significant quantity.
Tc-99: The chemical form of technetium has not been determined.
I-129: Iodine is not expected to be present in significant quantity.
Ra: The chemical form of radium has not been determined.
Th: The chemical form of thorium has not been determined.
U: The chemical form of uranium has not been determined.
Np: The chemical form of neptunium has not been determined.
Pu: The chemical form of plutonium has not been determined.

WASTE STREAM **2D127** **Uranium Plants Final Decommissioning: Processing Plants**

Nuclide	Mean radioactivity, TBq/m³ Waste at 1.4.2025	Bands and Code	Future Arisings	Bands and Code	Nuclide	Mean radioactivity, TBq/m³ Waste at 1.4.2025	Bands and Code	Future Arisings	Bands and Code
H 3			~ 6.60E-11	C C 2	Gd 153				
Be 10				8	Ho 163				
C 14			~ 3.74E-12	C C 2	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			~ 1.39E-11	C C 2	Pb 205				
Fe 55			~ 1.37E-11	C C 2	Pb 210				8
Co 60			~ 1.71E-10	C C 2	Bi 208				
Ni 59				8	Bi 210m				
Ni 63			~ 5.37E-13	C C 2	Po 210				8
Zn 65			~ 5.07E-12	C C 2	Ra 223				
Se 79				8	Ra 225				
Kr 81					Ra 226			~ 5.58E-13	C C 2
Kr 85					Ra 228				
Rb 87					Ac 227				
Sr 90			~ 6.27E-09	C C 2	Th 227				
Zr 93				8	Th 228				
Nb 91					Th 229				8
Nb 92					Th 230				8
Nb 93m				8	Th 232			~ 5.80E-10	C C 2
Nb 94				8	Th 234				
Mo 93				8	Pa 231				8
Tc 97					Pa 233				
Tc 99			~ 5.57E-11	C C 2	U 232				
Ru 106			~ 8.25E-10	C C 2	U 233				8
Pd 107				8	U 234			~ 1.80E-09	C C 2
Ag 108m				8	U 235			~ 7.57E-10	C C 2
Ag 110m					U 236			~ 1.62E-10	C C 2
Cd 109					U 238			~ 4.65E-09	C C 2
Cd 113m					Np 237			~ 4.54E-10	C C 2
Sn 119m					Pu 236				
Sn 121m				8	Pu 238			~ 5.62E-10	C C 2
Sn 123					Pu 239			~ 9.77E-10	C C 2
Sn 126				8	Pu 240			~ 8.22E-10	C C 2
Sb 125					Pu 241			~ 2.17E-08	C C 2
Sb 126					Pu 242				8
Te 125m					Am 241			~ 8.93E-10	C C 2
Te 127m					Am 242m				8
I 129				8	Am 243				8
Cs 134			~ 3.25E-10	C C 2	Cm 242			~ 2.79E-13	C C 2
Cs 135				8	Cm 243				8
Cs 137			~ 5.97E-09	C C 2	Cm 244			~ 1.79E-12	C C 2
Ba 133					Cm 245				8
La 137					Cm 246				8
La 138					Cm 248				
Ce 144			~ 3.42E-10	C C 2	Cf 249				
Pm 145					Cf 250				
Pm 147			~ 7.95E-11	C C 2	Cf 251				
Sm 147					Cf 252				
Sm 151			~ 4.23E-13	C C 2	Unsp a			~ 4.77E-12	C C 2
Eu 152				8	Unsp b/g			~ 3.65E-10	C C 2
Eu 154			~ 8.15E-12	C C 2	**Total a**		**0** *	**1.17E-08**	*
Eu 155			~ 4.34E-12	C C 2	**Total b/g**		**0** *	**3.62E-08**	*

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