

WASTE STREAM	5C316	Solid Waste Complex Decommissioning LLW
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SITE Harwell

SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Nuclear Restoration Services Ltd (NRS)

WASTE TYPE LLW

WASTE VOLUMES

	Reported (m ³)	OR	Conditioned (m ³)	Packaged (m ³)
Stocks:	At 1.4.2025	= 0		
Future arisings:	1.4.2027 - 31.3.2035	= 2771.0		
Total future arisings:		2771.0		
Total waste volume:		2771.0		

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

Comment on arising rates: Arisings due to decommissioning in the Solid Waste Complex.

Additional information on quantities: Volumes updated for 2016 RWI to reflect SMART Inventory Review

Uncertainty factors on volumes: Stock (upper): x - Arisings (upper): x 1.30
Stock (lower): x - Arisings (lower): x 0.70

WASTE SOURCE Decommissioning of the solid waste complex.

PHYSICAL CHARACTERISTICS

General description: Hard metallic waste from decommissioning of cells, ventilation systems and pipework in facilities. The waste also includes concrete and building rubble.

Changes since waste generated: -

Bulk density (t/m³): ~ 2.0

Comment on density: Density based on density of a similar waste stream.

CHEMICAL COMPOSITION

General description and components (%wt): Metal, concrete and building rubble, cellulose, plastics and rubber.

Chemical state: Neutral

Sheet metal proportion / thickness: -

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel.....	P	-	
Other ferrous metals.....	~ 30.0	including a proportion of boronated steel - baffle plates (% TBC)	
Iron.....	-	-	
Aluminium.....	P	-	
Beryllium.....	-	-	
Cobalt.....	-	-	
Copper.....	P	-	
Lead.....	P	-	
Magnox/Magnesium.....	TR	-	
Nickel.....	-	-	
Titanium.....	-	-	
Uranium.....	-	-	
Zinc.....	NE	-	
Zircaloy/Zirconium.....	TR	-	
Other metals.....	NE	Antimony and uranium may also be present.	

Organics (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulose.....	10.0	-	
Paper, cotton.....	P	-	
Wood.....	~ 10.0	-	
Halogenated plastics.....	P	PVC and PTFE	
Total non-halogenated plastics.....	NE	-	
Condensation polymers.....	NE	-	
Others.....	NE	-	
Organic ion exchange materials.....	NE	-	
Total rubber.....	P	-	
Halogenated rubber.....	P	hypalon and neoprene	
Non-halogenated rubber.....	NE	-	
Hydrocarbons.....		-	
Oil or grease.....	-	-	
Fuel.....	-	-	
Asphalt/Tarmac (cont.coal tar).....	-	-	
Asphalt/Tarmac (no coal tar).....	-	-	
Bitumen.....	-	-	
Others.....	-	-	
Other organics.....	TR	-	

Other materials (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials.....	NE	-	
Inorganic sludges and flocs.....	NE	-	
Soil.....	NE	-	
Brick/Stone/Rubble.....	P	-	
Cementitious material.....	~ 60.0	-	
Sand.....		-	
Glass/Ceramics.....	= 0	-	
Graphite.....	= 0	-	
Desiccants/Catalysts.....		-	
Asbestos.....	= 0	-	
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.....	NE	-
Chloride.....	NE	-
Iodide.....	NE	-
Cyanide.....	NE	-
Carbonate.....	P	-
Nitrate.....	NE	-
Nitrite.....	NE	-
Phosphate.....	NE	-
Sulphate.....	NE	-
Sulphide.....	NE	-

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.....	-	-
Corrosive materials.....	= 0	-
Pyrophoric materials.....	= 0	-
Generating toxic gases.....	= 0	-
Reacting with water.....	= 0	-
Higher activity particles.....	-	-
Soluble solids as bulk chemical compounds.....	-	-

Hazardous substances / non hazardous pollutants:

	(%wt)	Type(s) and comment
Acrylamide.....	0	-
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):

Not yet determined		
	(%wt)	Type(s) and comment
EDTA.....	NE	-
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	Off-site	~~ 1.0
Decay storage		
Low force compaction		
Supercompaction (HFC)		
Incineration		
Drying/dewatering/liquid separation	Off-site	~ 2.0
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		= 97.0
Treatment not yet determined		
None		

Comments on planned treatments:

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 (m³)	Payload (m³)	Number of packages	Estimated start date for packaging
	-	-	-	-	-	-

Range in container waste loading: -

Other information on packaging and conditioning: -

Conditioned density (t/m³): -

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	= 97.0	2.0	
Expected to be disposed On-Site			
Expected to be managed by In-Situ Disposal			
Expected to be consigned to an Incineration Facility	= 1.0	0.40	
Expected to be consigned to a Metal Treatment Facility	= 2.0	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 04 05, 17 01 01, 17 02 01

Opportunities for alternative disposal routing: No

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

RADIOACTIVITY

Source: The radionuclide fingerprint (future arisings only) for this waste stream has been updated using data from waste stream 5C39.

Uncertainty: The above radionuclides are expected to be present but dominated by Co60 and Cs137. Full characterisation will be undertaken near to the start of decommissioning.

Measurement of radioactivities: -

Chemical form of radionuclides:

- H-3: Activation product.
- C-14: -
- Cl-36: -
- Se-79: -
- Tc-99: -
- I-129: -
- Ra: Decay product of fuel and sources.
- Th: Present due to contamination as a metal or oxide
- U: Present due to fuel contamination as metal or oxide.
- Np: -
- Pu: Activation of fuel.

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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			3.08E-06	C C 2	Gd 153				8
Be 10				8	Ho 163				8
C 14				8	Ho 166m				8
Na 22				8	Tm 170				8
Al 26				8	Tm 171				8
Cl 36				8	Lu 174				8
Ar 39				8	Lu 176				8
Ar 42				8	Hf 178n				8
K 40				8	Hf 182				8
Ca 41				8	Pt 193				8
Mn 53				8	Ti 204				8
Mn 54				8	Pb 205				8
Fe 55				6	Pb 210			1.64E-09	C C 2
Co 60			1.32E-05	C C 2	Bi 208				8
Ni 59				8	Bi 210m				8
Ni 63				6	Po 210			1.42E-09	C C 2
Zn 65				8	Ra 223				8
Se 79				8	Ra 225				8
Kr 81				8	Ra 226			1.42E-08	C C 2
Kr 85				8	Ra 228			1.87E-07	C C 2
Rb 87				8	Ac 227				8
Sr 90			3.01E-05	C C 2	Th 227				8
Zr 93				8	Th 228			1.30E-07	C C 2
Nb 91				8	Th 229				8
Nb 92				8	Th 230				8
Nb 93m				8	Th 232			3.29E-07	C C 2
Nb 94				8	Th 234			3.14E-07	C C 2
Mo 93				8	Pa 231				8
Tc 97				8	Pa 233				8
Tc 99				8	U 232				8
Ru 106			8.24E-09	C C 2	U 233				8
Pd 107				8	U 234			9.71E-08	C C 2
Ag 108m				8	U 235			2.37E-08	C C 2
Ag 110m				8	U 236				8
Cd 109				8	U 238			3.14E-07	C C 2
Cd 113m				6	Np 237				8
Sn 119m				8	Pu 236				8
Sn 121m				8	Pu 238			5.48E-07	C C 2
Sn 123				8	Pu 239			3.29E-06	C C 2
Sn 126				8	Pu 240			3.00E-07	C C 2
Sb 125				8	Pu 241			3.91E-05	C C 2
Sb 126				8	Pu 242				8
Te 125m				8	Am 241			5.84E-06	C C 2
Te 127m				8	Am 242m				8
I 129				8	Am 243				8
Cs 134			4.54E-08	C C 2	Cm 242				6
Cs 135				8	Cm 243				8
Cs 137			4.74E-05	C C 2	Cm 244			1.31E-07	C C 2
Ba 133				8	Cm 245				8
La 137				8	Cm 246				8
La 138				8	Cm 248				8
Ce 144				8	Cf 249				8
Pm 145				8	Cf 250				8
Pm 147				8	Cf 251				8
Sm 147				8	Cf 252				8
Sm 151				8	Unsp a				
Eu 152				6	Unsp b/g				
Eu 154			9.42E-07	C C 2	Total a	0	*	1.10E-05	*
Eu 155			3.05E-07	C C 2	Total b/g	0	*	1.35E-04	*

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