

WASTE STREAM	2A910	Care and Maintenance Preparation (Reactor LLW)
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SITE Calder Hall

SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Sellafield Ltd

WASTE TYPE LLW

WASTE VOLUMES

	Reported (m ³)	OR	Conditioned (m ³)	Packaged (m ³)
Stocks:	At 1.4.2025	= 0		
Future arisings:	1.4.2025 - 31.3.2027	= 0		
	1.4.2027 - 31.3.2030	= 0		
	1.4.2030 - 31.3.2031	~ 571.4		
	1.4.2031 - 31.3.2032	~ 571.4		
	1.4.2032 - 31.3.2033	~ 409.4		
	1.4.2033 - 31.3.2034	~ 409.4		
	1.4.2034 - 31.3.2035	~ 370.7		
	1.4.2035 - 31.3.2036	~ 370.7		
	1.4.2036 - 31.3.2037	~ 377.3		
	1.4.2037 - 31.3.2038	~ 377.3		
	1.4.2038 - 31.3.2039	~ 246.3		
	1.4.2039 - 31.3.2040	~ 246.3		
	1.4.2040 - 31.3.2041	~ 28.7		
	1.4.2041 - 31.3.2042	~ 1.4		
	1.4.2042 - 31.3.2043	~ 0.3		
	1.4.2043 - 31.3.2044	~ 0.3		
	1.4.2044 - 31.3.2045	< 0.1		
Total future arisings:		3980.8		
Total waste volume:		3980.8		

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

Comment on arising rates: -

Additional information on quantities: Early similar arisings are being consigned under the 2X22 waste stream. Although the overall volume of waste arising between the two streams should remain the same, the amount arising in any given year may vary due to programme changes.

Uncertainty factors on volumes: Stock (upper): x - Arisings (upper): x 2.00
Stock (lower): x - Arisings (lower): x 0.50

WASTE SOURCE Waste from Calder Hall Reactor Areas including turbine halls and LLW from Non-active support buildings e.g. workshops.

PHYSICAL CHARACTERISTICS

General description: Hard trash and redundant equipment. Steelwork from overhead crane structure & hoist mechanism, watertanks / storage cylinder, switchboards, pipework, flask transporter trailer, iodine void filter, cooling tower, precipitator unit, humidrier, charge chute, etc. Other materials such as timber from scaffolding, copper cabling, aluminium, brass, glass, lead, asbestos cement are also present. Includes some secondary waste.

Changes since waste generated: -

Bulk density (t/m³): ~ 0.70

Comment on density: Density of 0.7 t/m³ is an initial estimate subject to confirmation.

CHEMICAL COMPOSITION

General description and components (%wt): Metal (~95%), other inorganics (~2%), organics (~3%).

Chemical state: Neutral

Sheet metal proportion / thickness: This waste stream will contain waste of various sizes and thicknesses.

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel.....	~ 6.0	-	
Other ferrous metals.....	~ 86.0	-	
Iron.....		-	
Aluminium.....	~ 1.0	-	
Beryllium.....	= 0	-	
Cobalt.....	= 0	-	
Copper.....	~ 2.0	-	
Lead.....	TR	-	
Magnox/Magnesium.....	= 0	-	
Nickel.....	= 0	-	
Titanium.....		-	
Uranium.....	= 0	-	
Zinc.....	= 0	-	
Zircaloy/Zirconium.....	= 0	-	
Other metals.....	= 0	-	

Organics (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulotics.....	~ 2.0	-	
Paper, cotton.....	= 0	-	
Wood.....	~ 2.0	-	
Halogenated plastics.....	= 0	-	
Total non-halogenated plastics.....	~ 0.30	-	
Condensation polymers.....	= 0	-	
Others.....	~ 0.30	-	
Organic ion exchange materials.....	= 0	-	
Total rubber.....	= 0	-	
Halogenated rubber.....	= 0	-	
Non-halogenated rubber.....	= 0	-	
Hydrocarbons.....		-	
Oil or grease.....		-	
Fuel.....		-	
Asphalt/Tarmac (cont.coal tar).....		-	
Asphalt/Tarmac (no coal tar).....		-	
Bitumen.....		-	
Others.....		-	
Other organics.....	= 0.70	-	

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.....	~ 1.0	-	
Cementitious material.....	< 0.50	-	
Sand.....		-	
Glass/Ceramics.....	TR	-	
Graphite.....	= 0	-	
Desiccants/Catalysts.....		-	
Asbestos.....	< 0.50	Brown, white and blue asbestos may be present. The proportions of each type have not been determined.	
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.....	NE	-
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.....		-
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.....		-
DPTA.....		-
NTA.....		-
Polycarboxylic acids.....		-
Other organic complexants.....		-
Total complexing agents.....	NE	-

Physical components:

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

TREATMENT, PACKAGING AND DISPOSAL

Planned on-site / off-site treatment(s):

Treatment	On-site / Off-site	Stream volume %
Size reduction	Off-site	~ 5.0
Decay storage		
Low force compaction		
Supercompaction (HFC)		
Incineration		
Drying/dewatering/liquid separation	Off-site	~ 90.0
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		~ 5.0
Treatment not yet determined		
None		

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. For Inventory purposes, it is assumed incineration can be extended to this waste stream, consistent with the approach taken in 2X22. It has also been assumed that ~90% metallic waste will be treated by the supply chain and will subsequently be 'out of scope', with the remaining 10% consigned to LLWR for disposal as non-compactable LLW. The other inorganics are assumed to be non-compactable LLW that require no further treatment.

Conditioning method:

-

Conditioning plants:

Plant Name	Location

Likely conditioning matrix:

-

Further information on the conditioning matrix:

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Waste Packaging:

Likely container type:

Container	Waste packaged (vol%)	Waste loading (m³)	Payload (m³)	Number of packages	Estimated start date for packaging
1/2 Height IP-2 Disposal/Re-usable ISO (TC01/TC02)	5.0	10.0	18.3	20	-

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)	= 5.0	= 1.2	
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	= 5.0	= 0.14	
Expected to be consigned to a Landfill Facility			
Expected to be disposed On-Site	= 90.0	= 1.4	
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: Not yet determined

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

RADIOACTIVITY

Source: Activation and contamination of materials.

Uncertainty: Activity values are current best estimates. Specific activity is a function of operating history. The values are indicative of the activities that would be expected.

Measurement of radioactivities: Estimates were originally made for the 2004 UK RWI based on the specific activity of stream 2A03 General LLW (LLW from Calder Hall arising as a result of maintenance and operations) in the 2001 UK RWI. These have been modified by considering the current operational LLW waste stream 2X22.

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: The chemical form of chlorine has not been determined.
Se-79: The chemical form of selenium has not been determined.
Tc-99: The chemical form of technetium has not been determined.
I-129: The chemical form of iodine has not been determined.
Ra: Radium isotope content is expected to be insignificant.
Th: Thorium isotope content is expected to be insignificant.
U: Uranium isotope content is expected to be insignificant.
Np: Neptunium isotope content is expected to be insignificant.
Pu: Chemical form of plutonium isotopes has not been determined but may be plutonium oxides.

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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			= 8.00E-06	D D 2	Gd 153				8
Be 10				8	Ho 163				8
C 14			= 4.00E-07	D D 2	Ho 166m				8
Na 22					Tm 170				8
Al 26					Tm 171				8
Cl 36			= 8.00E-09	D D 2	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			= 1.00E-06	D D 2	Pb 205				8
Fe 55			= 3.00E-04	D D 2	Pb 210				8
Co 60			= 3.00E-05	D D 2	Bi 208				8
Ni 59				8	Bi 210m				8
Ni 63			= 3.00E-06	D D 2	Po 210				8
Zn 65			= 4.00E-07	D D 2	Ra 223				8
Se 79				8	Ra 225				8
Kr 81				8	Ra 226				8
Kr 85				8	Ra 228				8
Rb 87				8	Ac 227				8
Sr 90				8	Th 227				8
Zr 93				8	Th 228				8
Nb 91				8	Th 229				8
Nb 92				8	Th 230				8
Nb 93m				8	Th 232				8
Nb 94				8	Th 234				8
Mo 93				8	Pa 231				8
Tc 97				8	Pa 233				8
Tc 99				8	U 232				8
Ru 106				8	U 233				8
Pd 107				8	U 234				8
Ag 108m				8	U 235				8
Ag 110m				8	U 236				8
Cd 109				8	U 238				8
Cd 113m				8	Np 237				8
Sn 119m				8	Pu 236				8
Sn 121m				8	Pu 238				8
Sn 123				8	Pu 239				8
Sn 126				8	Pu 240				8
Sb 125			= 1.00E-07	D D 2	Pu 241				8
Sb 126				8	Pu 242				8
Te 125m				8	Am 241				8
Te 127m				8	Am 242m				8
I 129			= 1.00E-07	D D 2	Am 243				8
Cs 134				8	Cm 242				8
Cs 135				8	Cm 243				8
Cs 137			= 2.00E-08	D D 2	Cm 244				8
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				8
Eu 152				8	Unsp b/g			= 9.00E-07	D D 2
Eu 154				8	Total a	0	*	0	*
Eu 155				8	Total b/g	0	*	3.44E-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