

WASTE STREAM	5C310	Solid Waste Complex Decommissioning ILW
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SITE Harwell
SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Magnox 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 -	1.4.2027 - 31.3.2035.....	25.0 m ³
Total future arisings:		25.0 m ³
Total waste volume:		25.0 m ³

Comment on volumes: Arisings as a result of decommissioning. Contact-handled ILW from decommissioning of the Solid Waste Complex. Volumes estimated based on historic information and project review.

Uncertainty factors on volumes: Stock (upper): x Arisings (upper) x 1.2
 Stock (lower): x Arisings (lower) x 0.8

WASTE SOURCE Contact-handled ILW from decommissioning of the Solid Waste Complex.

PHYSICAL CHARACTERISTICS

General description: Waste from the PoCo/decommissioning of facilities, cells, ventilation systems and pipework.

Physical components (%vol): Ferrous metals, other metals, plastics, cellulose, glassware, and concrete.

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m³): ~2.9

Comment on density: Based on densities of streams 5C30 and 5C304 (similar waste types).

CHEMICAL COMPOSITION

General description and components (%wt): Metal, concrete , cellulose , plastic, rubber etc.

Chemical state: Neutral

Chemical form of radionuclides: H-3: Metal activation product.
 C-14: In labelled organic compounds and activation of metals.
 Ra: Found as an oxide, a nitrate, and as a sulphate.
 Th: Found as an oxide, a metal, and in irradiated fuel.
 U: Found as an oxide, a metal, and as a fuel.
 Pu: Found as an oxide, a metal, and as a fuel.

Metals and alloys (%wt): Metal is present in a large range of thicknesses

	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....	~~20.0		
Other ferrous metals.....	~~60.0		
Iron.....			
Aluminium.....	~~0.50		
Beryllium.....	P		
Cobalt.....			
Copper.....	P		
Lead.....	P		
Magnox/Magnesium.....	TR		

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Nickel.....
Titanium.....
Uranium.....
Zinc.....
Zircaloy/Zirconium..... P
Other metals..... TR Uranium, europium, cobalt,
magnesium, tin, and nickel.

Organics (%wt): The waste contains cellulosics in the form of paper, wood, wax and bitumen. The halogenated plastics which are present in the waste are PVC and PTFE, and the rubbers are neoprene and hypalon.

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulosics.....	~~6.0		
Paper, cotton.....	~~3.0		
Wood.....	~~3.0		
Halogenated plastics	~~2.0	PVC and PTFE	
Total non-halogenated plastics....	P		
Condensation polymers.....	~~1.0		
Others.....	NE		
Organic ion exchange materials....	P		
Total rubber.....	P		
Halogenated rubber	~~0.50	neoprene and hypalon.	
Non-halogenated rubber.....	~~0.50		
Hydrocarbons.....			
Oil or grease			
Fuel.....			
Asphalt/Tarmac (cont.coal tar)...			
Asphalt/Tarmac (no coal tar)....			
Bitumen.....			
Others.....			
Other organics.....	P		

Other materials (%wt): -

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials..	P		
Inorganic sludges and flocs.....	0		
Soil.....	0		
Brick/Stone/Rubble.....	0		
Cementitious material.....	~~5.0		
Sand.....			
Glass/Ceramics.....	P		
Graphite.....	P		
Desiccants/Catalysts.....			
Asbestos.....	TR		
Non/low friable.....			

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Moderately friable.....

Highly friable.....

Free aqueous liquids..... TR

Free non-aqueous liquids..... TR

Powder/Ash..... P

Inorganic anions (%wt): -

(%wt) Type(s) and comment

Fluoride..... TR

Chloride..... TR

Iodide..... TR

Cyanide..... NE

Carbonate..... TR

Nitrate..... TR

Nitrite..... TR

Phosphate..... TR

Sulphate..... TR

Sulphide..... TR

Materials of interest for waste acceptance criteria: Combustible metals comprise mainly uranium and other finely divided metals. Free liquids will be immobilised in cement or evaporated to dryness before conditioning. Powder may be present as a result of decommissioning operations.

(%wt) Type(s) and comment

Combustible metals..... TR

Low flash point liquids..... TR

Explosive materials..... TR

Phosphorus..... TR

Hydrides..... TR

Biological etc. materials..... TR

Biodegradable materials..... 0

Putrescible wastes..... TR

Non-putrescible wastes.....

Corrosive materials..... TR

Pyrophoric materials..... TR

Generating toxic gases..... TR

Reacting with water..... TR

Higher activity particles.....

Soluble solids as bulk chemical compounds.....

Hazardous substances / non hazardous pollutants: Lead and beryllium are present as metal. Trace levels of antimony may be present in the waste.

(%wt) Type(s) and comment

Acrylamide.....

Benzene.....

Chlorinated solvents.....

Formaldehyde.....
 Organometallics.....
 Phenol.....
 Styrene.....
 Tri-butyl phosphate.....
 Other organophosphates.....
 Vinyl chloride.....
 Arsenic.....
 Barium.....
 Boron..... 0
 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.....

Complexing agents (%wt): Yes

	(%wt)	Type(s) and comment
EDTA.....	TR	Present at trace levels (includes EDTA, Citrate, TBP, etc).
DPTA.....		
NTA.....		
Polycarboxylic acids.....		
Other organic complexants.....		
Total complexing agents.....	TR	

Potential for the waste to contain discrete items: No. In & of itself not a DI; waste stream may include DIs as defined elsewhere (notably any stainless steel components)

PACKAGING AND CONDITIONING

Conditioning method: The waste will be packaged into 6m3 boxes and placed in long-term storage in the Harwell ILW Store

Plant Name: -

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Location: Harwell
 Plant startup date: 2023
 Total capacity (m³/y incoming waste): -
 Target start date for packaging this stream: 2023
 Throughput for this stream (m³/y incoming waste): -
 Other information: -

Likely container type:	Container	Waste packaged (%vol)	Waste loading (m ³)	Payload (m ³)	Number of packages
	6m ³ concrete box (SD)	100.0	1.75	5.8	15

Likely container type comment: -
 Range in container waste volume: -
 Other information on containers: -
 Likely conditioning matrix: Pulverised Fly Ash / Ordinary Portland Cement
 Other information: -
 Conditioned density (t/m³): ~2.6
 Conditioned density comment: -
 Other information on conditioning: -
 Opportunities for alternative disposal routing: -

Baseline Management Route	Opportunity Management Route	Stream volume (%)	Estimated Date that Opportunity will be realised	Opportunity Confidence	Comment
-	-	-	-	-	-

RADIOACTIVITY

Source: Activity is principally contamination associated with historic operations.
 Uncertainty: The above radionuclides are expected to be present but predominantly dominated by Co60 and Cs137. Full characterisation will be undertaken near to the start of decommissioning.
 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: -

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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				6	Gd 153				8
Be 10				8	Ho 163				8
C 14				6	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	Tl 204				8
Mn 54				8	Pb 205				8
Fe 55				6	Pb 210				8
Co 60				6	Bi 208				8
Ni 59				6	Bi 210m				8
Ni 63				6	Po 210				8
Zn 65				8	Ra 223				8
Se 79				8	Ra 225				8
Kr 81				8	Ra 226				6
Kr 85				8	Ra 228				8
Rb 87				8	Ac 227				8
Sr 90				6	Th 227				8
Zr 93				8	Th 228				6
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				6
Ru 106				8	U 233				8
Pd 107				8	U 234				6
Ag 108m				8	U 235				6
Ag 110m				8	U 236				6
Cd 109				8	U 238				6
Cd 113m				6	Np 237				8
Sn 119m				8	Pu 236				8
Sn 121m				8	Pu 238				6
Sn 123				8	Pu 239				6
Sn 126				8	Pu 240				6
Sb 125				8	Pu 241				6
Sb 126				8	Pu 242				8
Te 125m				8	Am 241				6
Te 127m				8	Am 242m				8
I 129				8	Am 243				8
Cs 134				6	Cm 242				8
Cs 135				8	Cm 243				8
Cs 137				6	Cm 244				6
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	Other a				
Eu 152				8	Other b/g				
Eu 154				6	Total a	0			NE
Eu 155				6	Total b/g	0			NE

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