

<b>WASTE STREAM</b>	<b>7A117</b>	<b>Decommissioning Waste Uranium Contaminated ILW</b>
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**SITE** AWE Aldermaston

**SITE OWNER** Ministry of Defence

**WASTE CUSTODIAN** AWE plc

**WASTE TYPE** ILW

Is the waste subject to Scottish Policy: No

**WASTE VOLUMES**

		Reported
Stocks:	At 1.4.2022.....	0 m <sup>3</sup>
Future arisings -	1.4.2022 - 31.3.2027.....	0 m <sup>3</sup>
	1.4.2028 - 31.3.2030.....	98.0 m <sup>3</sup>
	1.4.2031 - 31.3.2033.....	94.0 m <sup>3</sup>
	1.4.2034 - 31.3.2036.....	94.0 m <sup>3</sup>
	1.4.2037 - 31.3.2039.....	14.0 m <sup>3</sup>
	1.4.2040 - 31.3.2042.....	14.0 m <sup>3</sup>
	1.4.2043 - 31.3.2080.....	0 m <sup>3</sup>
Total future arisings:		314.0 m <sup>3</sup>
Total waste volume:		314.0 m <sup>3</sup>

Comment on volumes: Future arisings are estimated on the decommissioning plans for facilities on-site, which have been recently reviewed. The review has seen a reduction in future arisings for this waste stream. The total volume of arisings will depend on the longevity of the AWE site, with estimates being based on a 2080 site closure.

Uncertainty factors on volumes: Stock (upper): x Arisings (upper) x 4.0  
 Stock (lower): x Arisings (lower) x 0.5

**WASTE SOURCE** Manufacture of fuel items, disposal of legacy waste and facility maintenance.

**PHYSICAL CHARACTERISTICS**

General description: The waste will consist of solids arising from decommissioning operations.

Physical components (%wt): As there is no current stock for this waste stream, and no disposals have been made in the past nine years, physical components are assumed to be unchanged from the 2019 UKRWI. Metallic waste (73.7%), plastics and rubber (22.1%), cellulose (3.8%), glass (0.3%) and asbestos (<0.1%).

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m<sup>3</sup>): ~0.45

Comment on density: The density is based on the 2013 UKRWI, as this was the last time stock was available to determine a density figure.

**CHEMICAL COMPOSITION**

General description and components (%wt): Metallic waste (73.7%), plastics and rubber (22.1%), cellulose (3.8%), glass (0.3%) and asbestos (<0.1%).

Chemical state: Neutral

Chemical form of radionuclides: H-3: Not present in 7A117 Waste Stream  
 C-14: Not present in 7A117 Waste Stream  
 Cl-36: Not present in 7A117 Waste Stream  
 Se-79: Not present in 7A117 Waste Stream  
 Tc-99: Not present in 7A117 Waste Stream  
 I-129: Not present in 7A117 Waste Stream  
 Ra: Only daughter products present from uranium in this waste stream. Oxide form  
 Th: Only daughter products present from uranium in this waste stream. Oxide form  
 U: Present in oxide form  
 Np: Not present in 7A117 Waste Stream  
 Pu: Not present in 7A117 Waste Stream

Metals and alloys (%wt): Predictions indicate that sheet metal of approximately 4 mm thickness will be present, arising from glove-boxes. Also, sheet metal from ductwork (6mm thickness) is likely to be present in the 7A117 Waste Stream.

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	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....	8.6		
Other ferrous metals.....	56.0		
Iron.....	NE		
Aluminium.....	5.8		
Beryllium.....	0.10		
Cobalt.....	0		
Copper.....	2.8		
Lead.....	0.40		
Magnox/Magnesium.....	0		
Nickel.....	0		
Titanium.....	0		
Uranium.....	0		
Zinc.....	0		
Zircaloy/Zirconium.....	0		
Other metals.....	0		

Organics (%wt): -

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulose.....	3.8		
Paper, cotton.....	3.2		
Wood.....	0.60		
Halogenated plastics .....	12.9		
Total non-halogenated plastics.....	6.1		
Condensation polymers.....	6.1		
Others.....	0		
Organic ion exchange materials....	0		
Total rubber.....	3.1		
Halogenated rubber .....	3.1		
Non-halogenated rubber.....	0		
Hydrocarbons.....	0		
Oil or grease .....	0		
Fuel.....	0		
Asphalt/Tarmac (cont.coal tar)...	0		
Asphalt/Tarmac (no coal tar)....	0		
Bitumen.....	0		
Others.....	0		
Other organics.....	0		

Other materials (%wt): -

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	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials..	0		
Inorganic sludges and flocs.....	0		
Soil.....	0		
Brick/Stone/Rubble.....	0		
Cementitious material.....	0		
Sand.....	0		
Glass/Ceramics.....	0.30		
Graphite.....	0		
Desiccants/Catalysts.....	0		
Asbestos.....	<0.10	Form of asbestos is likely to be moderate / highly friable.	
Non/low friable.....	NE		
Moderately friable.....	NE		
Highly friable.....	NE		
Free aqueous liquids.....	0		
Free non-aqueous liquids.....	0		
Powder/Ash.....	0		

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.....	P	
Putrescible wastes.....	0	
Non-putrescible wastes.....	P	Wood and paper waste.

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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:      Lead (0.4% wt) and asbestos (<0.1% wt).

	(%wt)	Type(s) and comment
Acrylamide.....		
Benzene.....	NE	
Chlorinated solvents.....	0	
Formaldehyde.....	0	
Organometallics.....	0	
Phenol.....	NE	
Styrene.....	0	
Tri-butyl phosphate.....	NE	
Other organophosphates.....	0	
Vinyl chloride.....	P	PVC present
Arsenic.....	NE	
Barium.....	0	
Boron.....	NE	
Boron (in Boral).....	NE	
Boron (non-Boral).....	0	
Cadmium.....	NE	
Caesium.....	0	
Selenium.....	NE	
Chromium.....	NE	
Molybdenum.....	NE	
Thallium.....	0	
Tin.....	NE	
Vanadium.....	NE	
Mercury compounds.....	0	
Others.....	NE	
Electronic Electrical Equipment (EEE)		
EEE Type 1.....	0	
EEE Type 2.....	0	
EEE Type 3.....	0	
EEE Type 4.....	0	
EEE Type 5.....	0	

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Complexing agents (%wt): No

	(%wt)	Type(s) and comment
EDTA.....	0	
DPTA.....	0	
NTA.....	0	
Polycarboxylic acids.....	0	
Other organic complexants.....	0	
Total complexing agents.....	0	

Potential for the waste to contain discrete items: Not yet determined.

**PACKAGING AND CONDITIONING**

Conditioning method: The proposal is to supercompact the 200 litre drums and load the pucks into a 500 litre drum and grout with cement.

- Plant Name: -
- Location: Sellafield, Seascale, Cumbria.
- Plant startup date: Unknown
- Total capacity (m<sup>3</sup>/y incoming waste): -
- Target start date for packaging this stream: -
- Throughput for this stream (m<sup>3</sup>/y incoming waste): -
- Other information: -

Likely container type:	Container	Waste packaged (%vol)	Waste loading (m <sup>3</sup> )	Payload (m <sup>3</sup> )	Number of packages
	500 l drum	100.0	~1	~0.5	314

Likely container type comment: The loading is an estimate based on experience with similar waste at Sellafield.

Range in container waste volume: A maximum of five pucks will be packed into a 500 litre drum.

Other information on containers: Not specified

Likely conditioning matrix: Not Specified

Other information: -

Conditioned density (t/m<sup>3</sup>): ~2.0

Conditioned density comment: The conditioned density is an estimate which is subject to change.

Other information on conditioning: -

Opportunities for alternative disposal routing: Not yet determined

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

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**RADIOACTIVITY**

Source:	Enriched uranium.
Uncertainty:	Declared activity of waste arising has limited accuracy as this waste has not been produced before.
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:	Fingerprints are well understood for this material type. Low and high resolution gamma-ray spectroscopy is principally used to assay this waste stream.
Other information:	Decay nuclides with a half-life of less than three months have been omitted.

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Nuclide	Mean radioactivity, TBq/m <sup>3</sup>				Nuclide	Mean radioactivity, TBq/m <sup>3</sup>			
	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					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				5
Co 60					Bi 208				
Ni 59					Bi 210m				
Ni 63					Po 210				5
Zn 65					Ra 223				5
Se 79					Ra 225				5
Kr 81					Ra 226				5
Kr 85					Ra 228				5
Rb 87					Ac 227				5
Sr 90					Th 227				5
Zr 93					Th 228				5
Nb 91					Th 229				5
Nb 92					Th 230				5
Nb 93m					Th 232				5
Nb 94					Th 234				5
Mo 93					Pa 231				5
Tc 97					Pa 233				5
Tc 99					U 232				
Ru 106					U 233				5
Pd 107					U 234		3.87E-04	DD	2
Ag 108m					U 235		1.22E-05	DD	2
Ag 110m					U 236		1.60E-06	DD	2
Cd 109					U 238		7.28E-06	DD	2
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					Other a				
Eu 152					Other b/g				
Eu 154					<b>Total a</b>	<b>0</b>	<b>4.08E-04</b>	<b>DD</b>	<b>2</b>
Eu 155					<b>Total b/g</b>	<b>0</b>	<b>0</b>		<b>5</b>

**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