

<b>WASTE STREAM</b>	<b>7A40</b>	<b>Experimental Metallic Vessels</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.....	9.0 m <sup>3</sup>
Future arisings -	1.4.2022 - 31.3.2080.....	0 m <sup>3</sup>
Total future arisings:		0 m <sup>3</sup>
Total waste volume:		9.0 m <sup>3</sup>

Comment on volumes: Operational requirements at AWE are dependent on Strategic Defence Reviews and are subject to change over time. Future arisings are currently predicted to be zero, as the associated experimental vessel programme has ceased. The stock volume is the nett volume of the vessels and does not include the final package proposal of the vessels being grouted into 3m<sup>3</sup> boxes. The stock volumes are recorded in a maintained electronic database and are accurate. The total volume of arisings is now zero as experimental programme for trials on vessels has ceased.

Uncertainty factors on volumes: Stock (upper): x 1.0 Arisings (upper) x  
 Stock (lower): x 1.0 Arisings (lower) x

**WASTE SOURCE** Processes involved with the production, maintenance and decommissioning of the UK's nuclear deterrent.

**PHYSICAL CHARACTERISTICS**

General description: Metallic vessels.

Physical components (%wt): Metal (77.0%), glass (2.86%), other materials (2.50%) and graphite (17.64%). Nothing has changed since the 2019 UKRWI.

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m<sup>3</sup>): 1.9

Comment on density: Reviewed in 2022 and same as 2019 UKRWI.

**CHEMICAL COMPOSITION**

General description and components (%wt): Metal (77.0%), glass (2.86%), other materials (2.50%) and graphite (17.64%). Note that the precise breakdown by weight is not available for publication due to the classification of certain materials.

Chemical state: Neutral

Chemical form of radionuclides: H-3: Not present in this waste stream  
 C-14: Not present in this waste stream  
 Cl-36: Not present in this waste stream  
 Se-79: Not present in this waste stream  
 Tc-99: Not present in this waste stream  
 I-129: Not present in this 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 waste stream in compound form (oxide, fluoride and hydride)  
 Np: Np-237 present in waste stream as oxide form from daughter product of Am-241 alpha decay.  
 Pu: Present in waste stream in plutonium hydride / oxide form

Metals and alloys (%wt): -

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	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....	0		
Other ferrous metals.....	76.9	Mild steel	
Iron.....	0		
Aluminium.....	0.05		
Beryllium.....	<0.01		
Cobalt.....	0		
Copper.....	0.05		
Lead.....	0		
Magnox/Magnesium.....	0		
Nickel.....	0		
Titanium.....	0		
Uranium.....	0		
Zinc.....	0		
Zircaloy/Zirconium.....	0		
Other metals.....	0		
Organics (%wt):	This waste contains PVC.		
	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulosics.....	0.81		
Paper, cotton.....	0		
Wood.....	0.81		
Halogenated plastics .....	0		
Total non-halogenated plastics.....	0.01		
Condensation polymers.....	0.01		
Others.....	0		
Organic ion exchange materials....	0		
Total rubber.....	0		
Halogenated rubber .....	0		
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.....	0.31			
Cementitious material.....	1.4			
Sand.....	0			
Glass/Ceramics.....	2.9			
Graphite.....	17.6			
Desiccants/Catalysts.....	0			
Asbestos.....	0			
Non/low friable.....	0			
Moderately friable.....	0			
Highly friable.....	0			
Free aqueous liquids.....	0			
Free non-aqueous liquids.....	0			
Powder/Ash.....	0			

Inorganic anions (%wt):      Metal hydrides, fluorides and nitrides are present in the waste. Note: nitrides are commonly used to harden materials.

	(%wt)	Type(s) and comment
Fluoride.....	NE	
Chloride.....	NE	
Iodide.....	0	
Cyanide.....	0	
Carbonate.....	0	
Nitrate.....	NE	
Nitrite.....	NE	
Phosphate.....	0	
Sulphate.....	NE	
Sulphide.....	0	

Materials of interest for waste acceptance criteria:      -

	(%wt)	Type(s) and comment
Combustible metals.....	NE	
Low flash point liquids.....	NE	
Explosive materials.....	NE	
Phosphorus.....	NE	
Hydrides.....	NE	
Biological etc. materials.....		
Biodegradable materials.....	NE	
Putrescible wastes.....	NE	

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Non-putrescible wastes.....	NE
Corrosive materials.....	NE
Pyrophoric materials.....	NE
Generating toxic gases.....	NE
Reacting with water.....	NE
Higher activity particles.....	NE
Soluble solids as bulk chemical compounds.....	NE

Hazardous substances /  
non hazardous pollutants: -

	(%wt)	Type(s) and comment
Acrylamide.....	0	
Benzene.....	NE	
Chlorinated solvents.....	0	
Formaldehyde.....	0	
Organometallics.....	0	
Phenol.....	NE	
Styrene.....	0	
Tri-butyl phosphate.....	NE	
Other organophosphates.....	0	
Vinyl chloride.....	NE	
Arsenic.....	NE	
Barium.....	0	
Boron.....	NE	
Boron (in Boral).....	NE	
Boron (non-Boral).....	NE	
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): Not yet determined

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

Potential for the waste to contain discrete items: Yes. The spheres are unlikely to be dismantled. The engineered look and robustness of the vessels may indeed group them as discrete items. However, the scheduled disposal route should make them not discrete items. But potential currently exists.

**PACKAGING AND CONDITIONING**

Conditioning method: The vessels are scheduled to be encapsulated in Corner-Lift 3m3 boxes.  
 Plant Name: HDVW Packaging Plant  
 Location: Aldermaston, Berkshire.  
 Plant startup date: -  
 Total capacity (m³/y incoming waste): -  
 Target start date for packaging this stream: -  
 Throughput for this stream (m³/y incoming waste): -  
 Other information: -

Likely container type:	Container	Waste packaged (%vol)	Waste loading (m³)	Payload (m³)	Number of packages
	Sellafield 3m³ box	100.0	~0.452	NE	20

Likely container type comment: 2205 Duplex Steel Corner Lift Box manufactured by Graham Engineering Ltd

Range in container waste volume: -

Other information on containers: Not specified

Likely conditioning matrix: Not Specified

Other information: -

Conditioned density (t/m³): NE

Conditioned density comment: -

Other information on conditioning: -

Opportunities for alternative disposal routing: No

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

Source: Uranium, plutonium and americium.

Uncertainty: The accuracy for the stocks has been calculated from looking at the variances in waste received since 1960.

Definition of total alpha and total beta/gamma: The total stock alpha and beta/gamma specific activity is calculated from the volume and activity of waste in stock. The fingerprint is not included as this is classified as secret.

Measurement of radioactivities: Mass balance was used.

Other information: Uranium isotopes are present mixed with plutonium.

## WASTE STREAM

7A40

## Experimental Metallic Vessels

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				
Co 60					Bi 208				
Ni 59					Bi 210m				
Ni 63					Po 210				
Zn 65					Ra 223				
Se 79					Ra 225				
Kr 81					Ra 226				
Kr 85					Ra 228				
Rb 87					Ac 227				
Sr 90					Th 227				
Zr 93					Th 228				
Nb 91					Th 229				
Nb 92					Th 230				
Nb 93m					Th 232				
Nb 94					Th 234				
Mo 93					Pa 231				
Tc 97					Pa 233				
Tc 99					U 232				
Ru 106					U 233				
Pd 107					U 234		6		
Ag 108m					U 235		6		
Ag 110m					U 236		6		
Cd 109					U 238		6		
Cd 113m					Np 237				
Sn 119m					Pu 236				
Sn 121m					Pu 238		6		
Sn 123					Pu 239		6		
Sn 126					Pu 240		6		
Sb 125					Pu 241		6		
Sb 126					Pu 242		6		
Te 125m					Am 241		6		
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>~3.30E+00</b>	<b>CC 2</b>	<b>0</b>	
Eu 155					<b>Total b/g</b>	<b>~4.24E-01</b>	<b>CC 2</b>	<b>0</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