

WASTE STREAM**7A21****Operational ILW Plutonium Contaminated****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.....	1609.6 m ³
Future arisings -	1.4.2022 - 31.3.2024.....	18.0 m ³
	1.4.2025 - 31.3.2027.....	157.0 m ³
	1.4.2028 - 31.3.2030.....	158.0 m ³
	1.4.2031 - 31.3.2033.....	151.0 m ³
	1.4.2034 - 31.3.2036.....	60.0 m ³
	1.4.2037 - 31.3.2039.....	15.0 m ³
	1.4.2040 - 31.3.2042.....	15.0 m ³
	1.4.2043 - 31.3.2045.....	15.0 m ³
	1.4.2046 - 31.3.2048.....	15.0 m ³
	1.4.2049 - 31.3.2051.....	15.0 m ³
	1.4.2052 - 31.3.2054.....	15.0 m ³
	1.4.2055 - 31.3.2057.....	15.0 m ³
	1.4.2058 - 31.3.2060.....	28.0 m ³
1.4.2061 - 31.3.2063.....	18.0 m ³	
1.4.2064 - 31.3.2080.....	0 m ³	
Total future arisings:		695.0 m ³
Total waste volume:		2304.6 m ³

Comment on volumes: The stock volume has increased since the previous UKRWI owing to inventory administration and is deemed accurate as of 2022. Future arisings are based on relevant facility predictions that are published in AWE's Site Decommissioning Liabilities Plan. The total volume of arisings will depend on the longevity of the AWE site with estimates being based on a 2080 site closure date.

Uncertainty factors on volumes: Stock (upper): x 2.0 Arisings (upper) x 3.0
 Stock (lower): x 0.5 Arisings (lower) x 0.3

WASTE SOURCE Organic and inorganic solids arising from operations with plutonium and uranium**PHYSICAL CHARACTERISTICS**

General description: The waste consists of solids arising from operations with plutonium and uranium. These include tools, filters, glove-boxes, discarded and unusable equipment. It also includes some facility re-kit (refurbishment) wastes.

Physical components (%wt): Metal (36.2%), cellulosic material (8.1%), plastics (39.9%), rubber (1.2%), rubble (4.3%), glass (1.8%) and graphite (8.5%)

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m³): 0.18

Comment on density: This figure has been derived using stock data from 2022 (total stream mass divided by the total stream volume).

CHEMICAL COMPOSITION

General description and components (%wt): Metal (36.2%), cellulosic material (8.1%), plastics (39.9%), rubber (1.2%), rubble (4.3%), glass (1.8%) and graphite (8.5%)

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Chemical state: Neutral

Chemical form of radionuclides: H-3: Not present in Waste Stream
 C-14: Not present in Waste Stream
 Cl-36: Not present in Waste Stream
 Se-79: Not present in Waste Stream
 Tc-99: Not present in Waste Stream
 I-129: Not present in 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 as oxide form
 Np: Np-237 likely to be present in waste stream in oxide form as daughter product of Am-241 alpha decay.
 Pu: Present in Waste Stream as oxide form

Metals and alloys (%wt): None is present as bulk items, all discreet items placed in ILW drums.

	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....	12.2		
Other ferrous metals.....	12.8		
Iron.....	0		
Aluminium.....	3.2		
Beryllium.....	1.3		
Cobalt.....	0		
Copper.....	2.6		
Lead.....	2.1		
Magnox/Magnesium.....	0		
Nickel.....	0		
Titanium.....	0		
Uranium.....	TR	Contaminant only	
Zinc.....	0		
Zircaloy/Zirconium.....	0		
Other metals.....	2.0	Tin (0.6%) and filters (1.4%)	

Organics (%wt): -

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulose.....	8.1		
Paper, cotton.....	7.1	Paper/fibreboard and cotton	
Wood.....	1.0		
Halogenated plastics	23.2	PVC	
Total non-halogenated plastics.....	16.7		
Condensation polymers.....	16.7		
Others.....	0		
Organic ion exchange materials....	TR		
Total rubber.....	1.2		
Halogenated rubber	1.2		
Non-halogenated rubber.....	0		
Hydrocarbons.....	0		
Oil or grease	0		
Fuel.....	0		

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Asphalt/Tarmac (cont.coal tar)...	0
Asphalt/Tarmac (no coal tar)....	0
Bitumen.....	0
Others.....	0
Other organics.....	0

Other materials (%wt): -

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials..	TR		
Inorganic sludges and flocs.....	0		
Soil.....	0		
Brick/Stone/Rubble.....	4.3		
Cementitious material.....	0		
Sand.....	0		
Glass/Ceramics.....	1.8		
Graphite.....	8.5		
Desiccants/Catalysts.....	0		
Asbestos.....	TR		
Non/low friable.....	TR		
Moderately friable.....	TR		
Highly friable.....	TR		
Free aqueous liquids.....	0		
Free non-aqueous liquids.....	0		
Powder/Ash.....	0		

Inorganic anions (%wt): -

	(%wt)	Type(s) and comment
Fluoride.....	0	
Chloride.....	P	
Iodide.....	0	
Cyanide.....	0	
Carbonate.....	0	
Nitrate.....	P	
Nitrite.....	0	
Phosphate.....	0	
Sulphate.....	1.0	
Sulphide.....	<0.01	

Materials of interest for waste acceptance criteria: Lead and asbestos are present in the waste stream

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	(%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	Paper, fibreboard and cotton
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 and asbestos are present in the waste stream

	(%wt)	Type(s) and comment
Acrylamide.....	0	
Benzene.....	0	
Chlorinated solvents.....	0	
Formaldehyde.....	0	
Organometallics.....	0	
Phenol.....	0	
Styrene.....	0	
Tri-butyl phosphate.....	0	
Other organophosphates.....	0	
Vinyl chloride.....	P	PVC present
Arsenic.....	0	
Barium.....	0	
Boron.....	0	
Boron (in Boral).....	0	
Boron (non-Boral).....	0	
Cadmium.....	0	
Caesium.....	0	
Selenium.....	0	
Chromium.....	0	
Molybdenum.....	0	
Thallium.....	0	
Tin.....	P	Tin (0.6% wt)

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Vanadium..... 0
 Mercury compounds..... 0
 Others..... 0
 Electronic Electrical Equipment (EEE)
 EEE Type 1..... 0
 EEE Type 2..... 0
 EEE Type 3..... 0
 EEE Type 4..... 0
 EEE Type 5..... 0

Complexing agents (%wt): Yes

	(%wt)	Type(s) and comment
EDTA.....	0	
DPTA.....	0	
NTA.....	0	
Polycarboxylic acids.....	TR	
Other organic complexants.....	TR	The waste stream is likely to contain trace amounts of organic complexing agents from decontamination operations.
Total complexing agents.....	TR	

Potential for the waste to contain discrete items: No.

PACKAGING AND CONDITIONING

Conditioning method: The proposal is to transfer the 205 litre drums to Sellafield for supercompaction, load into 500 litre drums, grout up with cement and interim store prior to final disposal to GDF or equivalent. Around 5 drum pucks will fit into a 500 litre drum.

Plant Name: Unknown

Location: Sellafield, Seascale, Cumbria.

Plant startup date: Unknown

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 (m ³)	Payload (m ³)	Number of packages
	500 l drum	100.0	~1	~0.47	2305

Likely container type comment: The loading is an estimate based on experience with similar waste at Sellafield and the early part of the AWE transfer programme.

Range in container waste volume: The current programme of shipment and supercompaction at Sellafield will allow 5 pucks to be packed into a 500 litre drum.

Other information on containers: Not specified

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Likely conditioning matrix: Not specified

Other information: -

Conditioned density (t/m³): ~2.0

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

Other information on conditioning: Drums are treated and packaged under the Sellafield WTC1a FLoC quality management system

Opportunities for alternative disposal routing: No

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

RADIOACTIVITY

Source: Operational processes that involve plutonium and uranium.

Uncertainty: The gross alpha and gross beta activity for the in-stock wastes is accurate, and with a revised breakdown using expected fingerprints from facilities. Projected activity is an estimate based on past arisings.

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 used with non-destructive assay techniques such as high resolution gamma-ray spectroscopy and passive neutron coincidence counting.

Other information: Decay nuclides with a half-life of less than 3 months have been omitted.

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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		6	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		6		6
Zn 65					Ra 223		6		6
Se 79					Ra 225		6		6
Kr 81					Ra 226		6		6
Kr 85					Ra 228		6		6
Rb 87					Ac 227		6		6
Sr 90					Th 227		6		6
Zr 93					Th 228		6		6
Nb 91					Th 229		6		6
Nb 92					Th 230		6		6
Nb 93m					Th 232		6		6
Nb 94					Th 234		6		6
Mo 93					Pa 231		6		6
Tc 97					Pa 233		6		6
Tc 99					U 232				
Ru 106					U 233		6		6
Pd 107					U 234	2.43E-05	BB 2		6
Ag 108m					U 235	9.53E-07	BB 2		6
Ag 110m					U 236	2.17E-07	BB 2		6
Cd 109					U 238	2.73E-06	BB 2		6
Cd 113m					Np 237		6		6
Sn 119m					Pu 236				
Sn 121m					Pu 238	6.67E-03	BB 2	5.01E-03	CC 2
Sn 123					Pu 239	1.14E-01	BB 2	1.31E-01	CC 2
Sn 126					Pu 240	3.58E-02	BB 2	3.44E-02	CC 2
Sb 125					Pu 241	4.12E-02	BB 2	5.38E-02	CC 2
Sb 126					Pu 242	8.22E-06	BB 2	5.33E-06	CC 2
Te 125m					Am 241	5.43E-02	BB 2	4.43E-02	CC 2
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					Total a	2.11E-01	BB 2	2.15E-01	CC 2
Eu 155					Total b/g	4.12E-02	BB 2	5.37E-02	CC 2

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