

WASTE STREAM	7A27	Operational LLW - Plutonium
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SITE AWE Aldermaston

SITE OWNER Ministry of Defence (MOD)

WASTE CUSTODIAN AWE plc

WASTE TYPE LLW

WASTE VOLUMES

	Reported (m ³)	OR	Conditioned (m ³)	Packaged (m ³)
Stocks:	At 1.4.2025	= 238.5		
Future arisings:	1.4.2025 - 31.3.2027	= 174.7		
	1.4.2028 - 31.3.2030	= 71.4		
	1.4.2031 - 31.3.2033	= 72.5		
	1.4.2034 - 31.3.2036	= 56.8		
	1.4.2037 - 31.3.2039	= 55.5		
	1.4.2040 - 31.3.2042	= 88.1		
	1.4.2043 - 31.3.2045	= 3.8		
	1.4.2046 - 31.3.2048	= 4.0		
	1.4.2049 - 31.3.2050	= 3.8		
	1.4.2051 - 31.3.2053	= 3.8		
	1.4.2054 - 31.3.2056	= 9.2		
	1.4.2057 - 31.3.2059	= 0.8		
	1.4.2060 - 31.3.2062	= 5.5		
	1.4.2063 - 31.3.2080	= 0		
Total future arisings:		549.6		
Total waste volume:		788.1		

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

Comment on arising rates: Slight increase in operational stock since 2022 UK RWI. Future arisings taken from recent update to AWE Operational waste estimation plans, correct as of February 2025.

Additional information on quantities: Stock volumes are recorded on the site waste management database and therefore, are considered to be accurate. The total volume of arisings will depend on the longevity of the AWE site, with estimates being based on a site closure date of 2080 or beyond.

Uncertainty factors on volumes: Stock (upper): x 1.00 Arisings (upper): x 5.00
Stock (lower): x 1.00 Arisings (lower): x 0.20

WASTE SOURCE Waste arising from plutonium operations.

PHYSICAL CHARACTERISTICS

General description: The waste contains metals, plastics and cellulosic materials.

Changes since waste generated: Encapsulated oils and sludges are no longer part of this waste stream.

Bulk density (t/m³): ~ 0.33

Comment on density: This figure has been derived using stock data from 2025 (total stream mass divided by the total stream volume).

CHEMICAL COMPOSITION

General description and components (%wt): Metals (70.01%), organics (29.2%) and other (0.79%)

Chemical state: Neutral

Sheet metal proportion / thickness: -

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel.....	~ 16.9	-	
Other ferrous metals.....	~ 50.8	-	
Iron.....	= 0	-	
Aluminium.....	~ 0.40	-	
Beryllium.....	= 0	-	
Cobalt.....	= 0	-	
Copper.....	~ 1.3	-	
Lead.....	~ 0.10	-	
Magnox/Magnesium.....	= 0	-	
Nickel.....	= 0	-	
Titanium.....	= 0	-	
Uranium.....	= 0	-	
Zinc.....	= 0	-	
Zircaloy/Zirconium.....	= 0	-	
Other metals.....	~ 0.50	Brass 0.038%, Galvanised steel 0.187%, Mercury 0.275%	

Organics (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulose.....	~ 17.4	-	
Paper, cotton.....	~ 14.3	Includes Hoover bags and contents, HEPA filter media.	
Wood.....	~ 3.1	-	
Halogenated plastics.....	~ 3.0	PVC	
Total non-halogenated plastics.....	~ 3.3	Not segregated on waste records into constituent types.	
Condensation polymers.....	-	-	
Others.....	-	-	
Organic ion exchange materials.....	= 0	-	
Total rubber.....	~ 3.7	Not segregated on waste records into constituent types.	
Halogenated rubber.....	-	-	
Non-halogenated rubber.....	-	-	
Hydrocarbons.....	= 1.4	-	
Oil or grease.....	= 0	-	
Fuel.....	= 0	-	
Asphalt/Tarmac (cont.coal tar).....	= 0	-	
Asphalt/Tarmac (no coal tar).....	= 0	-	
Bitumen.....	~ 1.4	-	
Others.....	= 0	-	
Other organics.....	~ 0.40	Leather 0.052%, Ethylene Glycol 0.022%, Vegetation 0.336%	

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.....	~ 0.37	-	
Cementitious material.....	= 0	-	
Sand.....	~ 0.10	-	
Glass/Ceramics.....	~ 0.10	-	
Graphite.....	= 0	-	
Desiccants/Catalysts.....	= 0	-	
Asbestos.....	~ 0.02	-	
Non/low friable.....	-	-	
Moderately friable.....	-	-	
Highly friable.....	-	-	
Free aqueous liquids.....	~ 0.20	-	
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.....	= 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 0	-
Putrescible wastes.....	= 0	-
Non-putrescible wastes.....	P 0	Wood, paper 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:

-

	(%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 0	PVC
Arsenic.....	NE 0	-
Barium.....	= 0	-
Boron.....	NE 0	-
Boron (in Boral).....	NE 0	-
Boron (non-Boral).....	= 0	-
Cadmium.....	NE 0	-
Caesium.....	= 0	-
Selenium.....	= 0	-
Chromium.....	= 0	-
Molybdenum.....	= 0	-
Thallium.....	= 0	-
Tin.....	= 0	-
Vanadium.....	= 0	-
Mercury compounds.....	= 0	-
Others.....	~ 0.10	Waste lab chemicals not segregated into constituents 0.1%

Complexing agents (%wt):

No

	(%wt)	Type(s) and comment
EDTA.....	= 0	-
DPTA.....	= 0	-
NTA.....	= 0	-
Polycarboxylic acids.....	= 0	-
Other organic complexants.....	= 0	Complexing agents are not present in the waste stream
Total complexing agents.....	= 0	-

Physical components:

	Number	Type(s) and comment
Sources.....	= 0	-
Electronic & Electrical Equipment (EEE)		
EEE Type 1.....	NE	EEE unable to be segregated into constituent types. Number of items unable to be estimated. Approx. 1.823%wt of waste stream.
EEE Type 2.....	-	-
EEE Type 3.....	-	-
EEE Type 4.....	-	-
EEE Type 5.....	-	-

TREATMENT, PACKAGING AND DISPOSAL

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

Treatment	On-site / Off-site	Stream volume %
Size reduction		
Decay storage		
Low force compaction		
Supercompaction (HFC)	Off-site	~ 3.0
Incineration	Off-site	~ 35.0
Drying/dewatering/liquid separation		
Tie down/fixatives/strippable coating/painting application		
Decontamination		
Metal treatment	Off-site	~ 55.0
Recycling / reuse		
Thermal treatment, including vitrification		
Encapsulation		
Polymer encapsulation		
Other physical treatment		
Other chemical treatment		
Containerisation		
Treatment not yet determined		
None		~ 7.0

Comments on planned treatments:

The treatment figures above are estimations only.

Conditioning method:

-

Conditioning plants:

Plant Name	Location

Likely conditioning matrix:

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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)	3.0	17.0	18.3	2	-

Range in container waste loading:

Other information on packaging and conditioning:

Wastes destined for LLWR are likely to go via supercompaction.

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)			
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	~ 3.0	~ 0.33	
Expected to be consigned to a Landfill Facility	~ 7.0	~ 0.33	
Expected to be disposed On-Site			
Expected to be managed by In-Situ Disposal			
Expected to be consigned to an Incineration Facility	~ 35.0	~ 0.33	
Expected to be consigned to a Metal Treatment Facility	~ 55.0	~ 0.33	
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: 17 06 05*, 15 02 02*, 15 02 03, 20 01 40, 20 03 01

Opportunities for alternative disposal routing: No

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

RADIOACTIVITY

Source: Plutonium (principally) and uranium contaminated material.

Uncertainty: The gross alpha and gross beta activities for the in-stock wastes are accurate. The radionuclide breakdown has been estimated.

Measurement of radioactivities: Typically this waste is measured using high resolution gamma-ray spectroscopy.

Chemical form of radionuclides: H-3: May be present in the waste stream in very small specific activities in HTO, HT and organically bound forms

C-14: May be present in the waste stream in very small specific activities

Cl-36: May be present in the waste stream in very small specific activities

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

WASTE STREAM 7A27 Operational LLW - Plutonium									
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		5		5	Gd 153				
Be 10		5			Ho 163				
C 14		5			Ho 166m				
Na 22					Tm 170				
Al 26					Tm 171				
Cl 36		5			Lu 174				
Ar 39					Lu 176				
Ar 42					Hf 178n				
K 40					Hf 182				
Ca 41					Pt 193				
Mn 53		5		5	Ti 204				
Mn 54					Pb 205				
Fe 55		5		5	Pb 210		5		5
Co 60	~ 1.09E-09	B B 2	= 7.21E-12	C C 2	Bi 208				
Ni 59					Bi 210m				
Ni 63		5		5	Po 210		5		5
Zn 65		5			Ra 223		5		5
Se 79					Ra 225		5		5
Kr 81					Ra 226		5		5
Kr 85					Ra 228		5		5
Rb 87					Ac 227		5		5
Sr 90		5			Th 227		5		5
Zr 93					Th 228		5		5
Nb 91					Th 229		5		5
Nb 92					Th 230		5		5
Nb 93m					Th 232		5		5
Nb 94		5			Th 234		5		5
Mo 93					Pa 231		5		5
Tc 97					Pa 233		5		5
Tc 99					U 232				
Ru 106		5			U 233		5		5
Pd 107					U 234	~ 2.17E-06	B B 2	= 1.65E-06	C C 2
Ag 108m					U 235	~ 1.30E-06	B B 2	= 5.51E-08	C C 2
Ag 110m		5			U 236	~ 3.24E-08	B B 2	= 4.28E-09	C C 2
Cd 109					U 238	~ 1.90E-08	B B 2	= 1.32E-06	C C 2
Cd 113m					Np 237				5
Sn 119m					Pu 236				
Sn 121m					Pu 238	~ 6.71E-06	B B 2	= 1.60E-07	C C 2
Sn 123					Pu 239	~ 1.30E-04	B B 2	= 5.21E-06	C C 2
Sn 126					Pu 240	~ 3.04E-05	B B 2	= 1.15E-06	C C 2
Sb 125		5			Pu 241	~ 1.38E-04	B B 2	= 4.02E-06	C C 2
Sb 126					Pu 242	~ 4.48E-10	B B 2	= 1.37E-10	C C 2
Te 125m					Am 241	~ 3.64E-04	B B 2	= 7.10E-07	C C 2
Te 127m					Am 242m				
I 129		5			Am 243				
Cs 134		5			Cm 242				
Cs 135					Cm 243				
Cs 137	~ 9.80E-08	B B 2			Cm 244				
Ba 133		5			Cm 245				
La 137					Cm 246				
La 138					Cm 248				
Ce 144		5			Cf 249				
Pm 145					Cf 250				
Pm 147					Cf 251				
Sm 147					Cf 252				
Sm 151					Unsp a				
Eu 152					Unsp b/g				
Eu 154					Total a	5.35E-04	*	1.03E-05	*
Eu 155					Total b/g	1.38E-04	*	4.02E-06	*

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