WASTE STREAM	7A22	Operational ILW Tritium Hard Waste

SITE AWE Aldermaston

SITE OWNER Ministry of Defence (MOD)

WASTE CUSTODIAN AWE plc

WASTE TYPE ILW

WASTE VOLUMES

		Reported (m^3)
Stocks:	At 1.4.2025	= 27.5
Future arisings:	1.4.2025 - 31.3.2027	= 1.4
	1.4.2028 - 31.3.2030	= 3.3
	1.4.2031 - 31.3.2033	= 0
	1.4.2034 - 31.3.2036	= 2.0
	1.4.2037 - 31.3.2039	= 3.0
	1.4.2040 - 31.3.2042	= 3.0
	1.4.2043 - 31.3.2045	= 3.0
	1.4.2046 - 31.3.2049	= 3.0
	1.4.2050 - 31.3.2052	= 3.0
	1.4.2053 - 31.3.2055	= 3.0
	1.4.2056 - 31.3.2058	= 3.0
	1.4.2059 - 31.3.2080	= 0
Total future arisings:		**27.7**
Total waste volume:		**55.1**

OR

Conditioned (m^3)	Packaged (m^3)

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

Comment on arising rates: Future arisings have been derived from waste operational predictions.

Additional information on quantities: Stock volume are recorded in a recently issued database, and are therefore considered to be accurate. The total volume of arisings will depend on the longevity of the AWE site, with estimates based on a site closure date of 2080.

Uncertainty factors on volumes:

Stock (upper):	x 1.00	Arisings (upper):	x 5.00
Stock (lower):	x 1.00	Arisings (lower):	x 0.50

WASTE SOURCE Operations involving tritium.

PHYSICAL CHARACTERISTICS

General description: Mainly metallic content.

Changes since waste generated: -

Bulk density (t/m³): = 0.46

Comment on density: Stock reviewed and no additional waste has been generated since the previous UK RWI. The total stream mass has been divided by the total stream volume.

CHEMICAL COMPOSITION

General description and components (%wt): Metal (49.57%), cellulosics (4.69%), halogenated plastics (17.61%), non-halogenated plastics (22.45%), ceramics (2.89%), and vermiculite (2.79%).

Chemical state: Neutral

Sheet metal proportion / thickness: Discreet metallic items

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel	= 23.5	-	
Other ferrous metals		-	
Iron		-	
Aluminium	= 25.8	-	
Beryllium		-	
Cobalt		-	
Copper	= 0.31	-	
Lead		-	
Magnox/Magnesium		-	
Nickel		-	
Titanium		-	
Uranium	NE	Present as a contaminant only	
Zinc		-	
Zircaloy/Zirconium		-	
Other metals		-	

Organics (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulosics	= 4.7	-	
Paper, cotton	= 4.7	-	
Wood	= 0	-	
Halogenated plastics	= 17.6	PVC	
Total non-halogenated plastics	= 22.5	-	
Condensation polymers	= 22.5	-	
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):

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials	= 0	-	
Inorganic sludges and flocs	= 0	-	
Soil	= 0	-	
Brick/Stone/Rubble	= 2.8	Vermiculite (described as rubble)	
Cementitious material	= 0	-	
Sand	= 0	-	
Glass/Ceramics	= 2.9	-	
Graphite	= 0	-	
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	-	

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	-
Putrescible wastes	= 0	-
Non-putrescible wastes	P	-
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	-
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	= 0	-
Vanadium	= 0	-
Mercury compounds	= 0	-
Others	= 0	-

Complexing agents (%wt): No

	(%wt)	Type(s) and comment
EDTA	= 0	-
DPTA	= 0	-
NTA	= 0	-
Polycarboxylic acids	= 0	-
Other organic complexants	= 0	This waste contains no complexing agents.
Total complexing agents	= 0	-

Physical components:

	Number	Type(s) and comment
Sources		-
Electronic & Electrical Equipment (EEE)		-
EEE Type 1		-
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)		
Incineration	Off-site	~ 20.0
Drying/dewatering/liquid separation		
Tie down/fixatives/strippable coating/painting application		
Decontamination		
Metal treatment	Off-site	~ 70.0
Recycling / reuse	Off-site	~ 10.0
Thermal treatment, including vitrification		
Encapsulation		
Polymer encapsulation		
Other physical treatment		
Other chemical treatment		
Containerisation		
Treatment not yet determined		
None		

Comments on planned treatments: Management of most of the ILW Tritium Hard Waste; TSBs and other hard waste items are sentenced for treatment and disposal offsite. Potential a percentage of the wastes can be recycled/reused on site, also probably a percentage of the wastes will be recategorised to LLW. The above volumes are estimations only.

Conditioning method: -

Conditioning plants:

Plant Name	Location

Likely conditioning matrix: -

Further information on the conditioning matrix: -

Waste Packaging:

Likely container type:

Container	Waste packaged (vol%)	Waste loading (m^3)	Payload (m^3)	Number of packages	Estimated start date for packaging
-	-	-	-	-	-

Range in container waste loading:

Other information on packaging and conditioning: -

Conditioned density (t/m^3): -
Conditioned density comment: -

Management Routes:

Disposal Route	Stream volume %	Raw density t/m^3	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			
Expected to be consigned to a Landfill Facility			
Expected to be disposed On-Site			
Expected to be managed by In-Situ Disposal			
Expected to be consigned to an Incineration Facility	~ 20.0	~ 0.46	
Expected to be consigned to a Metal Treatment Facility	~ 70.0	~ 0.46	
Expected to be Out of Scope			
Expected to be recycled / reused	~ 10.0	~ 0.46	
Disposal route not known			

Classification codes for waste expected to be consigned to a landfill facility:

Opportunities for alternative disposal routing: Not yet determined

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

RADIOACTIVITY

Source: Tritium contamination diffused into items and as surface contamination or dust.

Uncertainty: Revised specific activity for stock wastes has been taken from the on-site waste database and is considered accurate. Predicted waste activities are more diffcult and have been based on knowledge of arisings coupled with previous stock data. Tritium storage bed (TSB) devices include 100 grams depleted uranium per container. No waste TSB currently in stock.

Measurement of radioactivities: Individual ILW items are assayed using caloriemtry, mass balance or head-space analysis of a drum. Sampling followed by destructive assay is used to a lesser degree.

Chemical form of radionuclides:

H-3: Present in the waste stream through diffusion and uranium/titanium tritride (HTO, HT and organically/chemically bound)
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: Not present in Waste Stream
Pu: Not present in Waste Stream

WASTE STREAM **7A22** **Operational ILW Tritium Hard Waste**

Nuclide	Mean radioactivity, TBq/m³ Waste at 1.4.2025	Bands and Code	Future Arisings	Bands and Code	Nuclide	Mean radioactivity, TBq/m³ Waste at 1.4.2025	Bands and Code	Future Arisings	Bands and Code
H 3	= 6.46E-01	B B 2	= 7.27E+00	C C 2	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			= 1.37E-12	C C 2
Co 60					Bi 208				
Ni 59					Bi 210m				
Ni 63					Po 210			= 1.33E-12	C C 2
Zn 65					Ra 223			= 1.66E-11	C C 2
Se 79					Ra 225				
Kr 81					Ra 226			= 3.89E-12	C C 2
Kr 85					Ra 228			= 5.80E-18	C C 2
Rb 87					Ac 227			= 1.66E-11	C C 2
Sr 90					Th 227			= 1.64E-11	C C 2
Zr 93					Th 228			= 5.40E-18	C C 2
Nb 91					Th 229				
Nb 92					Th 230			= 3.76E-07	C C 2
Nb 93m					Th 232			= 7.01E-18	C C 2
Nb 94					Th 234			= 1.53E-06	C C 2
Mo 93					Pa 231			= 3.42E-11	C C 2
Tc 97					Pa 233				
Tc 99					U 232				
Ru 106					U 233				
Pd 107					U 234			= 8.53E-07	C C 2
Ag 108m					U 235			= 3.36E-08	C C 2
Ag 110m					U 236			= 2.96E-09	C C 2
Cd 109					U 238			= 1.53E-06	C C 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					Unsp a				
Eu 152					Unsp b/g				
Eu 154					**Total a**	**0**	*	**2.80E-06**	*
Eu 155					**Total b/g**	**6.46E-01**	*	**7.27E+00**	*

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